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and **Volume 5, number 5** was 5 April 1984.

THREE NEW SPECIES OF BORYA Labill. (LILIACEAE)

by

D. M. CHURCHILL *

ABSTRACT

Churchill, D. M. Three new species of *Borya* Labill. (Liliaceae). *Muelleria* 6(1): 1-8 (1985). — *Borya constricta*, *B. laciniata* and *B. mirabilis* are described as new. The first two species are confined to south-western Australia and the third species to Victoria. Plants of each species are in cultivation in the Royal Botanic Gardens, Melbourne.

INTRODUCTION

The genus *Borya* Labill. has been the subject of a long term study which is not yet completed. In compliance with the request for taxonomic treatment of the genus in the 'Flora of Australia', the following taxa are described. Numerical values given in the descriptions refer to the range and, where appropriate, average dimensions for samples of 100 or more measurements.

TAXONOMY

Borya constricta D. M. Churchill, sp., nov., *B. nitidae* Labill. affinis sed folliis puberulis et rigidis, constrictis; bracteis nigris, apicibus acutis, maturitate separatis; pedunculis deciduis.

TYPUS: From a plant in cultivation, Royal Botanic Gardens, Melbourne, accession no. 841099, originally from Karalee Rocks (Caroling Rocks), 16 km E. of Yellowdine, Western Australia, 31°16.9′ S., 119°48.8′ E., 19.i.1970, *D. M. Churchill 65*. HOLOTYPUS: 9.vi.1983 (MEL 628557, 1 piece). ISOTYPUS: BM. PARATYPUS: 4.xi.1981 (CGE); 13.vii.1982 (MEL 628557, 5 pieces); 23.v.1984 (G,K, PERTH); 26.vi.1984 (LD).

B. nitida Labill. var. *sublanosa* F. Muell. ex Baker, *J. Linn Soc. Lond. Bot.* 17:414 (1879). TYPE: *Drummond 98* (Lectotype (here chosen): CGE. Isolectotypes: G 5821-22, MEL 51048).

[*B. sublanosa* F. Muell. ex Benth., Fl. Austral. 7:71 (1878), *nom. pro. syn. sub. B. nitida* Labill.]

Herba caespitosa aestate dormiens perennis 2-25 cm alta 2-40 cm lata. *Caules* erecti vel reclinati simplices vel ramosi atri. *Folia* 24-48 apice surculi cuiusque, linearia rigida 8-20 mm longa 0.6-1.2 mm lata, duobis sulcis abaxialibus stomatophoris usque ad dehiscentiae articulum 0.7-1.0 mm latum extensis; apice pungentia atra facile separata; margine ciliata numquam scabridiuscula. *Foliorum superiorum bases* 0.3-1.0 mm longae fulvae; margine laevi et infra dehiscentiae articulum constricto; sulco stomatophoro absente. *Foliorum inferiorum bases* dilatatae atrobrunneae pilis longis tenuibus implexis marginatae. *Pedunculi* 20-36 (av. 28) mm longi 0.75-1.5 plo foliis longiores 0.6-1.0 mm diametro in dimidio, tempore inflorescentiae annua vice exuti, dehiscentiae articulo prope basim semper praediti. *Inflorescentia* obovata-turbinata, 7-10 (av. 9) mm longa 4-10 (av. 6) mm lata; flores 6-12 (av. 9). *Bracteae involucrales* in duobus verticillis dispositae; exterior erectus bracteis 2-5 (av. 4) foliiformibus quarum longissima 6-11 mm longa est, margine et carina et apice ciliata, ala basali lacerata; interior bracteis 1-4 (av. 2) squamosis, interdum carinis pilosis, apicibus acutis. *Bracteae florales* in gemma imbricatae in statu maturo non imbricatae. *Perianthium* hypocrateriforme, lobis anguste ovatis. *Antherae* pallido flavae eglandulatae. *Semina* 0.64-0.74 mm longa, 0.55-0.6 mm lata. *Testa* atra colliculosa.

Herbaceous, tufted, summer-dormant perennial 2-25 cm high, 2-40 cm wide. *Stems* erect or reclining, simple or branched, black. *Leaves* 24-48 per shoot apex, linear, rigid, 8-20 mm long, 0.6-1.2 mm wide, with two abaxial stomata-bearing grooves extending to the abscission joint which is 0.7-1.0 mm wide; apices pungent-pointed, black, easily detached; margins ciliate, never microscabrate. *Upper leaf-base* 0.3-1.0 mm long, pale brown; margin smooth, constricted below the abscission joint; stomatal groove absent or reduced in width. *Lower leaf-base* dilated, blackish-brown; margins with long fine tangled hairs. *Peduncles* 20-36 (av. 28) mm long, 0.75-1.5 times length of leaves, 0.6-1.0 mm diam at mid-length,

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shed annually with inflorescence; abscission joint always present near base. *Inflorescences* obovate-turbinate, 7-10 (av. 9) mm long, 4-10 (av. 6) mm wide at maturity, with 6-12 (av. 9) flowers. *Involucral bracts* in two whorls; outer whorl erect, with 2-5 (av. 4) leaf-like bracts, the outermost bract 6-11 mm long, ciliate at margins, keel and apices and with the basal wing lacerate; inner whorl with 1-4 (av. 2) black scale-like bracts, these sometimes keeled and then ciliate, bract apices acute. *Floral bracts* imbricate in bud, not overlapping at maturity. *Perianth* hypocrateriform; lobes narrowly ovate. *Anthers* pale yellow, eglandular. *Testa* black, colliculose.

SELECTED SPECIMENS EXAMINED:

Western Australia — Cowcowing, "iix. 1904," *M. Koch 1105* (K, MEL 51049, PERTH). Upper Serpentine River, North Bannister, 5.ix.1981, *R. Letouzey 278* (K, P). Karoling, 17.xi.1891, *P. Helms* (MEL 51073). 10 miles E. of Southern Cross, voucher for P74, 7.ix.1974, *G. J. Keighery 22* (PERTH). Newdegate, 14.v.1972, *G. J. Keighery 4252* (PERTH).

DISTRIBUTION:

South-western Australia. Widespread within the region from Wubin to Cowcowing, Manmanning, Bullabulling, south-east to Mt Ragged, west to Cape Riche and north through Pingrup and Lake Grace to Wongan Hills. Outlier populations are found in the Darling Range near Perth, e.g. Sullivan Rocks. This species often occurs at the same locality, but from slightly drier sites, as *Borya sphaerocephala* R.Br. or *Borya laciniata*. At Kuender these three species are associated with one granitic outcrop.

NOTES:

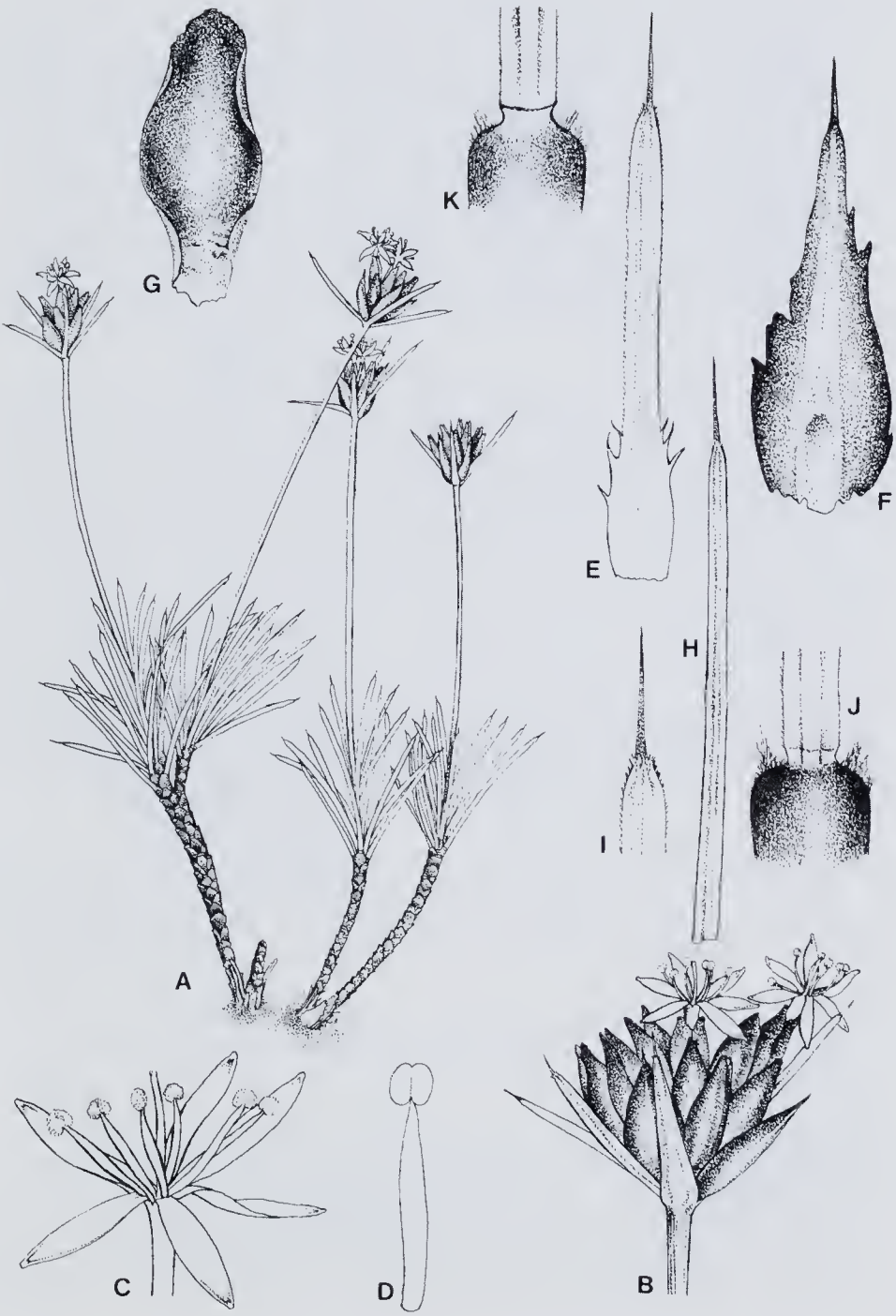
The specific epithet refers to the characteristically constricted margins of the upper leaf-base.

B. constricta may be easily recognised by the deciduous peduncles with an abscission joint near the base of each, the black-brown and constricted leaf-base with finely matted marginal hairs, the ciliate margins of the leaves and the longest bracts, the black pungent leaf apices and the non-overlapping floral bracts in mature inflorescences.

Plants are locally common and associated with granitic outcrops where they grow in the drier, skeletal ferruginous sands of the rock joints. Soil pH at the type locality ranged from 4.4 to 6.2. Flowers appear in late winter and early spring and scapes are shed with seed in late spring or early summer. Plants subjected to water stress while flowering may retain scapes until the following autumn. Leaves turn orange from middle to late spring and the plants become dormant and remain so until a return to low temperatures and autumn rains. While dormant, the leaves remain at ambient relative humidities and can withstand drying to R.H. 0.0% for prolonged periods (several years). Old leaves re-green and lower leaves are shed when dormancy is broken in autumn. Plants of this species are therefore drought resistant and known as "resurrection plants" (See details given under *B. nitida* nom. ambig. in Gaff & Churchill, *Aust. J. Bot.* 24:209-224 (1976)).

In the cultivated plant from which the type specimens were taken dormancy is induced each year through cessation of watering from mid-November to mid-March, i.e. from late spring to late summer, and broken by re-commencement of watering. Inflorescences start development 4 weeks after watering breaks dormancy, flowering occurs after 16 weeks and continues for 4-6 weeks. Perfume, recorded on plants in the field, has never been detected on plants of this species in cultivation.

Fig. 1. *Borya constricta*, a — habit, x 1. b — inflorescence showing 4 outer involucral bracts, 1 inner involucral bract (lower r.h.s.) and spreading floral bracts, x 3. c — flower, x 8. d — stamen with eglandular anther, x 15. e — outermost involucral bract with fine pubescence and laciniate lower wing, x 8. f — inner involucral bract, x 8. g — floral bract opened out, x 6. h — leaf detached at abscission joint, x 4. i — pubescent leaf apex, x 24. j — lower leaf-base (abaxial surface) with wide, darkly pigmented lower segment bearing fine tangled hairs. Note the unusual extension of the stomatal grooves below the abscission joint, x 8. k — lower leaf-base (abaxial surface). Usual shape, the stomatal grooves not extending below the abscission joint, x 8. All except k from living material, Royal Botanic Gardens, Melbourne, cultivation accession no. 832048,. grown on from *Churchill 64* (MEL 628554), 50 km peg from Perth on Albany Highway. k from *P.S. Short 1974* and *S.J. Forbes* (MEL 656816) from the type locality.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Borya laciniata D. M. Churchill, sp. nov., *B. scirpoideae* Lindl. affinis sed caulibus tegetes formantibus; foliis arcuatis; bracteis involucrales 1-3; perianthio infundibuliformi; testa favulariis confertis praedita, praesertim differt.

TYPUS: Anderson Rocks, Hyden, Western Australia, 32°10′ S., 118°51′ E., 13.ix.1982, *P.S. Short 1719* (Holotypus: MEL 618324. Isotypus: K, PERTH).

Herbacea tegetem formans aestate dormiens decidua perennis ad 3 cm alta, 8-60 cm lata. *Caules* prostrati intertexti fulvi. *Folia* 6-18 apice surculi cuiusque, secunda plerumque arcuata interdum recta flexibilia 6-20 mm longa 0.3-0.7 mm lata, duobus sulcis abaxialibus stomatophoris latis pallidis usque ad basem foliorum inferiorum extensis sine strictura ad dehiscentiae articulum 0.25-0.74 mm latum; apice obtusa acuminata vel acicularia fulva vel brunnea, margine laevia ad scabridiuscula. *Foliorum superiorum bases* 0.1-0.5 mm longae virides margine laeves et rectae. *Foliorum inferiorum bases* longae angustae virides, membrana marginali incolorata lobo dilute pigmentiferi laciniato terminata. *Pedunculi* 10-25 (av. 18) mm longi 0.4-0.8 (av. 0.5) mm diametro in dimidio, tempore inflorescentiae annua vice exuti, dehiscentiae articulo prope basim semper praediti. *Inflorescentia* obovoidea 4-6 (av. 5) mm longa 2.5-5.5 (av. 4) mm lata; flores 3-6 (av. 4). *Bracteae involucrales* una vel tria prope bracteas florales visae, quarum longissima 3-7 mm longa, ad apices laeve vel scabridiusculae et parum recurvatae, ala basali laevis vel margine modice fissa. *Bracteae florales* cucullatae, in gemma imbricatae in statu maturo non imbricatae, apice obtusae membranaceae parum recurvatae fulvae; pagina laevi vel breviter et pallide carinata. *Perianthium* infundibuliforme, lobis ovatis. *Antherae* armeniaceae, glandula apicali parva alba. *Stigma* rotundatum ad parum triangulatum in statu vivo, subtiliter papillatum. *Testa* favulariis confertis praedita.

Herbaceous, mat-forming, summer-dormant, deciduous perennial to 3 cm high, 8-60 cm wide. *Stems* prostrate, interlocking, pale brown. *Leaves* 6-18 per shoot apex, secund, usually arcuate, sometimes straight, flexible, linear, 6-20 mm long, 0.3-0.7 mm wide, with two broad pale abaxial stomata-bearing grooves which extend to the lower leaf base; leaves without constriction at the abscission joint which is 0.25-0.74 mm wide; apices blunt, acuminate or acicular, pale to dark brown; margins smooth to micro-scabrate. *Upper leaf-base* 0.1-0.5 mm long, pale green; margins smooth, straight. *Lower leaf-base* long and narrow, pale green with a colourless marginal membrane terminated by a faintly pigmented laciniate lobe or lobes. *Peduncles* 10-25 (av. 18) mm long, 0.4-0.8 (av. 0.5) mm diam. at mid-length, shed with inflorescence annually; abscission joint always present near base. *Inflorescences* obovoid, 4-6 (av. 5) mm long, 2.5-5.5 (av. 4) mm wide, with 3-6 (av. 4) flowers. *Involucral bracts* 1 to 3, the longest 3-7 mm long, smooth or microscabrate towards the apices and often slightly recurved, with basal wing smooth or simply notched at the margins. *Floral bracts* cucullate, imbricate in bud, not overlapping at maturity; apices obtuse, membranous, slightly recurved, light brown; surface smooth or with short pale central keel. *Perianth* infundibuliform; lobes ovate. *Anthers* orange-yellow, with small white apical gland. *Stigma* rounded to slightly triangular when fresh, finely papillate. *Testa* with crowded favularia.

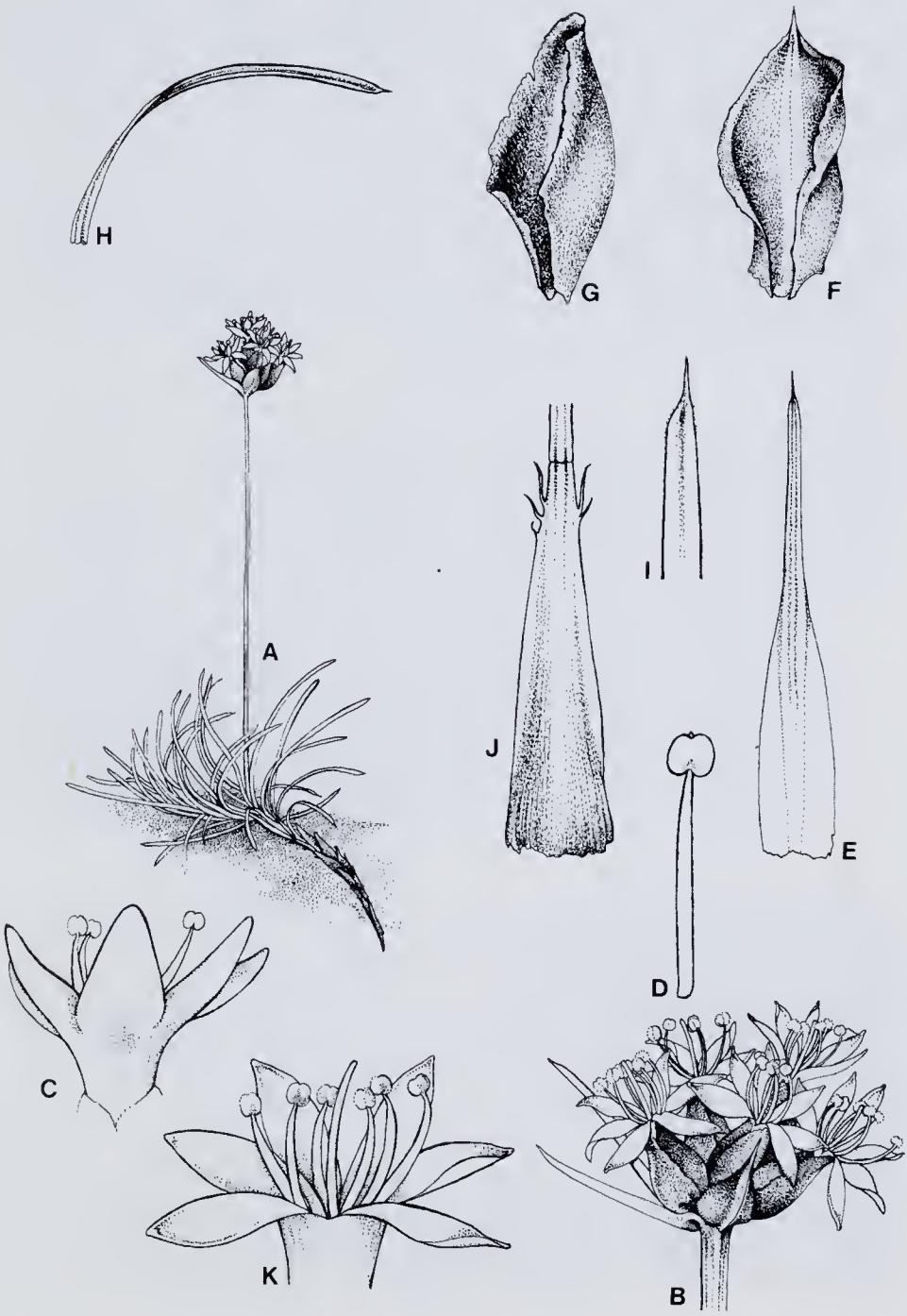
SELECTED SPECIMENS EXAMINED:

Western Australia — Swan River, vii.1848, *J. Drummond 341* (CGE, G5821-20, MEL 51038). Manmanning, 30°51′ S., 117°12′ E., 1978, *A. George s.n.* (MEL 589547; Roy. Bot. Gard. Melbourne cult. acc. no. 781098). Kuender, 32°57.2′ S., 118°32.4′ E., 17.xi.1983, *D.M. Churchill 50* (MEL 665084; Roy. Bot. Gard. Melbourne cult. acc. no. 832064). 4.5 miles E. of Highbury, 33°05′ S., 117°19′ E., 29.ix.1971, *A. George 11062* (MEL, PERTH). Tutanning Reserve, 18.viii.1975, *G.J. Keighery 301* (PERTH).

DISTRIBUTION:

South-western Australia. Badgingarra, Watheroo, Wongan Hills, Manmanning, Tammin, Hyden, Ongerup, Borden, Highbury, east of Pingelly, Goomalling.

Fig. 2. *Borya laciniata*. a — habit, x 1. b — inflorescence showing 3 involucral bracts and spreading floral bracts, x 3. c — perianth, x 6. d — stamen with glandular anther, x 12. e — longest involucral bract, x 8. f — shortest involucral bract, x 8. g — floral bract x 8. h — leaf detached at abscission joint and straighter than from many native habitats, x 2. i — leaf apex with microscabrae, x 8. j — leaf-base (abaxial surface) with abscission joint, long tapering margins to stem sheath and laciniate fringe, x 4. k — perianth, x 6. All except d and k from living material, Royal Botanic Gardens, Melbourne, cultivation accession no. 781098, grown on from *A. George s.n. B* (MEL 589547), Manmanning. d from holotype. k from *G. Keighery 6597* (PERTH).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NOTES:

The specific epithet refers to the laciniate lobes of the upper leaf margins. This character is variable and ranges from smooth entire margins to highly dissected lobes. In most specimens at least some leaf-bases have simple lobes with terminal fringe.

B. laciniata may be confused with *Borya scirpoidea* Lindl. because there is an overlap in some characters. However the prostrate mat habit, the three or fewer involucral bracts, the secund arrangement of leaves that are rarely without a laciniate lobed base, the wide perianth tube with short broad segments and the distinctively favulariate patterned seed characterise the species. *B. scirpoidea* in contrast has stems below ground level, ascending tufted leaves with radially symmetrical placement and with the leaf-bases rarely lobed, the perianth tube narrow, the seed smoothly undulate with fine transverse striae and, in addition, the floral bracts are usually imbricate, even at maturity.

Plants are found on soils ranging from skeletal granitic sands, loamy sands, sandy clay loams, to swampy clay soils. Most soils are subject to periodic flooding or winter waterlogging. Soil pH under plants at Kuender was 6.2. Associated larger trees and shrubs include *Eucalyptus loxophleba, E. occidentalis, E. wandoo, Acacia acuminata* or *Casuarina campestris.* Some associated herbs, such as *Hyalochlamys globifer,* indicate saline soils.

Flowers appear in late winter and early spring, and scapes are shed with seed and leaves in late spring or early summer, leaving dormant stems. New leaves are produced each season and the plants are "drought avoiders".

Borya mirabilis D.M. Churchill, sp. nov., ab omnibus speceibus praecedentibus manifeste distincta, bracteis quam bracteolis brevioribus; placentatione contorta.

TYPUS: Mackey's Peak, Wonderland Range, The Grampians, Victoria, 37°11′ S., 142°31′ E., 13.ix.1982, *D.M. Churchill 66* (Holotypus: MEL 628551. Isotypus: G, K, LD).

Herbacea caespitosa aestate dormiens perennis, 3-15 cm alta 3-10 cm lata. *Caules* erecti vel reclinati simplices vel ramosi brunnei. *Folia* 25-45 apice surculi cuiusque, linearia flexibilia 10-16 mm longa 0.5-0.7 lata, duobus sulcis abaxialibus stomatophoris usque ad basem foliorum superiorum extensis strictura parva vel nulla ad dehiscentiae articulum 0.5-0.8 mm latum; apice obtusa acuminata brunnea, margine laevia glabra. *Foliorum superiorum bases* 0.1-0.4 mm longae, margine laeves fulvae decrescentes. *Foliorum inferiorum bases* ad vaginam gradatim dilatatae, fulvae ad brunneas, pilis tenuibus emplexis marginatae. *Pedunculi* 30-70 (av. 50) mm longi, 0.6-1.1 (av. 0.8) mm diametro in dimidio, aliquot annos in caule retenti, dehiscentiae articulo nullo praediti. *Inflorescentia* ellipsoidea-obovata 6-10 (av. 8) mm longa, 4-8 (av. 6) mm lata; flores 4-12 (av. 8-9). *Bracteae involucrales* in duobus verticillis dispositate: exterior divergens bracteis 3-6 (av. 4) foliiformibus quarum longissima 7-13 (av. 10) mm longa ad apicem glabra, ala basali laevis; interior bracteis 0-10 (av. 4) brunneis squamosis apice acerosis. *Bracteae florales* in gemma imbricatae in statu maturo non imbricatae, bracteolis breviores, fulvae, apice mucronatae; pagina laevis, costa elevata. *Perianthium* hypocrateriforme, lobis anguste ovatis. *Antherae* flavae apice glandulosae. *Ovarium* placentatione maxime contorta. *Semina* non visa. *Testa* ovulorum colliculosa.

Herbaceous, tufted, summer-dormant perennial 3-15 cm high, 3-20 cm wide. *Stems* erect or reclining, simple or branched, dark brown. *Leaves* 25-45 per shoot apex, linear, flexible, 10-16 mm long, 0.5-0.7 mm wide, with two abaxial stomata-bearing grooves which extend to the upper leaf-base and with little or no constriction at the abscission joint which is 0.5-0.8 mm wide; apices obtuse with acuminate point, brown; margins smooth and glabrous. *Upper leaf-bases* 0.1-0.4 mm long; margins smooth, pale brown, tapering. *Lower leaf-bases* widening to a sheath, light to dark brown; margins with fine tangled hairs. *Peduncles* 30-70 (av. 50) mm long, 0.6-1.1 (av. 0.8) mm diam. at mid-length, retained on stem for several years; abscission joint absent. *Inflorescences* ellipsoidal-obovate, 6-10 (av. 8) mm long, 4-8 (av. 6) mm wide, with 4-12 (av. 8-9) flowers. *Involucral bracts* in two whorls: outer whorl divergent, with 3-6 (av. 4) leaf-like bracts, the outermost 7-13 (av. 10) mm long, glabrous to the apex and with the basal wing smooth; inner whorl with 0-10 (av. 4) brown scale-like bracts with acerose apices. *Floral bracts* imbricate in the bud, not overlapping at maturity, shorter than bracteoles, light brown; apices mucronate; surface smooth with central raised midrib. *Perianth* hypocrateriform; lobes narrow-ovate. *Anthers* yellow; apices glandular. *Ovary* with highly contorted placentation. *Testa* of ovules colliculose.

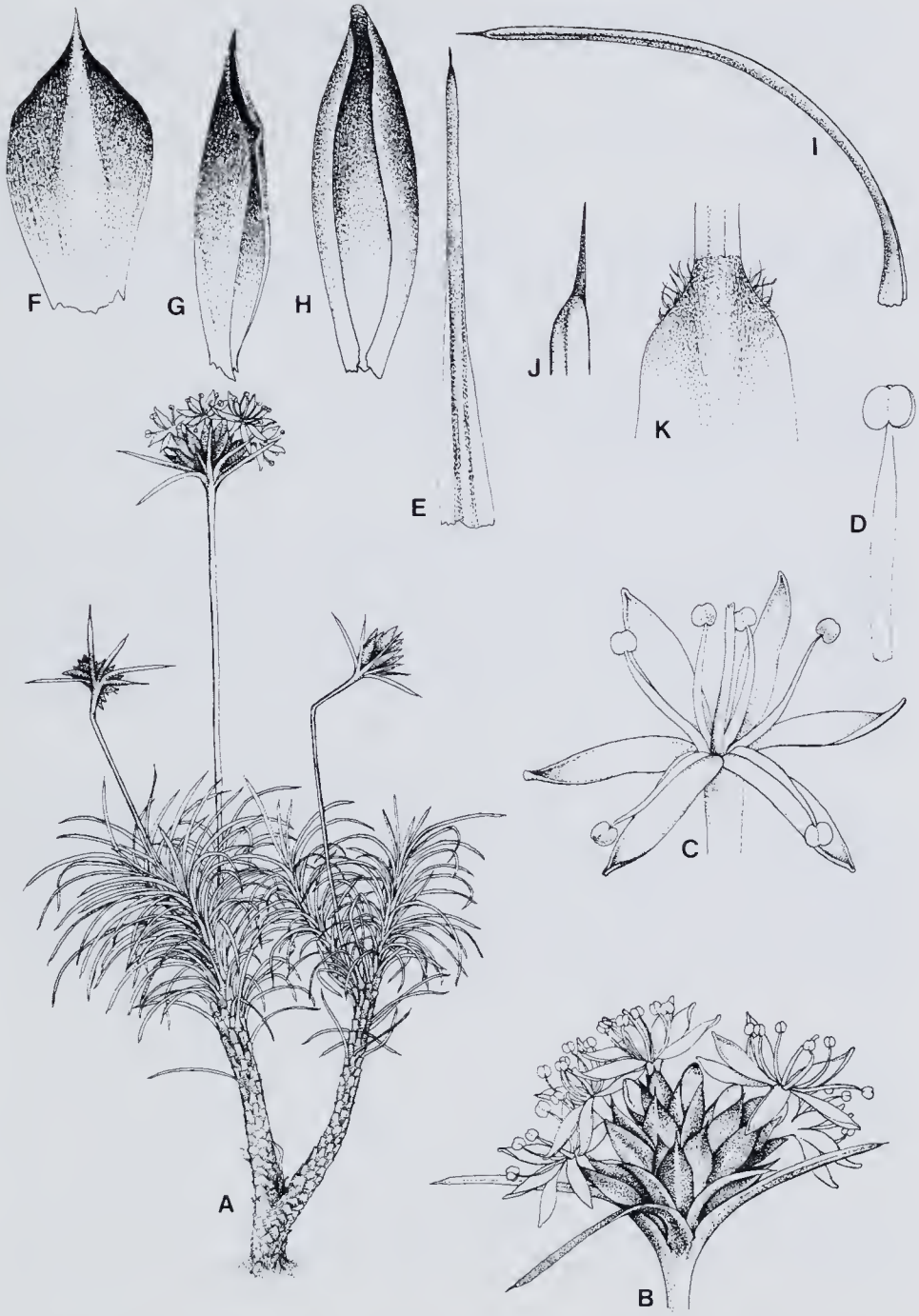

Fig. 3. *Borya mirabilis*. a — habit x 1. b — inflorescence showing outer and inner involucral bracts and spreading floral bracts, x 2. c — perianth, x 4. d — stamen with glandular anther, x 8. e — longest involucral bract, x 4. f — inner involucral bract, x 8. g — floral bract, x 8. h — floral bracteole, x 8. i — leaf with basal sheath, x 3. j — leaf apex, x 8. k — lower leaf-base, broadly wedged-shaped with fine tangled hairs, x 8. All from living material, Royal Botanic Gardens, Melbourne, cutlivation accession no. 841100, grown on from *Churchill 67* (MEL 628553), Mackey's Peak.

SELECTED SPECIMENS EXAMINED:

Victoria (Grampians) — Wonderland Peak, x.1924, *C.W. Dalton* (MEL 51089). Summit of Mackey's Peak, 30.x.1952, *R. Melville and P.F. Morris, led by L.C. Dalton* (MEL 51090). On steep slopes and sandstone rocks of Mackey's Peak, 30.x.1952, *R. Melville 1853, P. Morris, C. D'Alton & R. Warry* (MEL 51013).

DISTRIBUTION:

The Grampians, Victoria. Confined to one locality where there are a few plants within a few square metres on Mackey's Peak.

NOTES:

The specific epithet refers to the remarkably isolated occurrence of this species in the Wonderland Range of The Grampians. It is also remarkable that it does not appear to set seed and must therefore depend for its precarious survival on vegetative reproduction and absence of fire. The species must be regarded as being on the verge of extinction.

B. mirabilis is unlikely to be confused with any other species. The bracteoles are longer than the floral bracts and this alone distinguishes it.

The soil pH under these plants is 5.1. Flowers appear in spring, in October and early November. Leaves turn orange in December and plants stay dormant until the autumn. The species is "drought resistant".

ACKNOWLEDGEMENTS

I am most grateful to each of the following people who spared no effort to collect specimens from isolated nominated areas and to introduce plants for study into cultivation in the Royal Botanic Gardens: A. Baird, J. and W. Brown, P. Christensen, S. and C. Churchill, B. Conn, S. Forbes, D. Gaff, A. George, J. Laidlaw, N. Marchant, T. Maughan, G. McCraith, J. Ross, P. Short, R. Tudor, W. Worboys and M. Westera. Anita Podwyszynski, Botanical Illustrator of the Royal Botanic Gardens and National Herbarium, Melbourne, provided the illustrations. The directors and curators of collections of the following herbaria kindly provided loans of *Borya* specimens: BM, BRIS, CANB, CGE, G, LD and PERTH.

Dr Michael Crisp, while Australian Botanical Liaison Officer at Kew Herbarium undertook the detailed examination of unnamed, superficially similar, test specimens, selected from all south-western Australian *Borya* taxa and anatomical drawings for comparison with Labillardiere's type material of *B. nitida* in Florence. He also drew my attention to type material (!) in Geneva. Mr Alex George generously supplied colour transparencies of the holotype and notes of Labillardiere that relate to *B. nitida*. Drs John Green, Terry McFarlane and Neville Marchant of the Western Australian Herbarium and Mr Richard Burchnall are also thanked for their generous time and assistance in many supportive ways.

Manuscript received 4 October 1984.

A REVISION OF ACTINOBOLE Fenzl ex Endl. (COMPOSITAE: INULEAE: GNAPHALIINAE)

by

P. S. Short *

ABSTRACT

Short, P. S. A revision of *Actinobole* Fenzl ex Endl. (Compositae: Inuleae: Gnaphaliinae). *Muelleria* 6(1): 9-22. (1985). — The endemic Australian genus *Actinobole* Fenzl ex Endl. is revised. Four species are recognised and two of them, *A. drummondiana* P. S. Short and *A. oldfieldiana* P. S. Short, are described as new. The grounds for their delimitation, primarily on anther characteristics and pollen-ovule ratios, are discussed.

INTRODUCTION

In a recent paper (Short, 1981) I suggested that the genus *Actinobole* Fenzl ex Endl., which is confined to Australia, contained only two species, *A. condensatum* (A. Gray) P. S. Short and *A. uliginosum* (A. Gray) H. Eichler. The former species is usually readily distinguished from *A. uliginosum* by having a larger general involucre surrounding the capitula. The leaf-like bracts are c. 1.5-3 times the length of the capitulum whereas in *A. uliginosum* they are about the length of the capitula. However within *A. condensatum* two entities were distinguishable on differences in pollen-ovule ratios (P/O's) and anther length. One entity, referred to as an "outbreeder", had an average P/O of 2,037.4. The other entity, an "inbreeder", had an average P/O of 373.1. Since 1981 more collections have been examined, particularly for differences in P/O's and anther characteristics. My results confirm the existence of two entities within *A. condensatum* s. lat. and show that two taxa, similarly differentiated on P/O values and anther size, also exist within *A. uliginosum* s. lat. In this paper I formally give the taxa distinguished on such differences specific status.

MATERIALS AND METHODS

P/O's and Anther Measurements

Only bisexual florets, each with a single ovule, occur in *Actinobole* and thus to determine pollen-ovule ratio's it is only necessary to determine the number of pollen grains per floret. To count pollen indehisced, mature anthers were removed from florets and mounted in glycerin jelly containing gentian violet. When squashed, mature anthers readily discharged pollen or else they flattened and thereby allowed all grains to be counted within intact anthers. Initially to determine P/O's all pollen grains were counted in a single floret removed from each of 15 or more individuals of a population. Two or more populations of each taxon were examined. Subsequently P/O's were determined for one or sometimes all individuals from additional collections (populations). All individual counts were combined to give average P/O's for each taxon.

Measurements pertaining to anther characteristics were also initially determined on a population basis and subsequently from one or several individuals from other collections. The measurements used to determine total anther length and the length of the microsporangia and the terminal anther appendage are depicted in Figure 1. Note that the anther tails are not included in measurements.

Specimens from both herbarium sheets and spirit collections were used for P/O determinations and anther measurements. Collections used for these determinations, at least on a population basis, are mainly housed in AD and MEL. Individuals on herbarium sheets from which a P/O determination and/or anther measurements were made are indicated by a pencilled "P" on the sheet.

Cytology

Chromosome number determinations were obtained from floral bud material and from root tips. Bud material was fixed, in the field, in 4 parts chloroform: 3 parts absolute ethyl

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

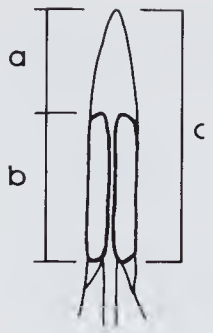

Fig. 1. Anther measurements. a — length of terminal anther appendage. b — length of microsporangium. c — total length of anther.

alcohol: 1 part glacial acetic acid. Root tips were obtained from freshly germinated seed and were fixed in 3 parts absolute alcohol: 1 part glacial acetic acid. Before fixation root tips were placed in a 20 ppm solution of IPC (Storey & Mann, 1967) for two hours. Anther material was stained with aceto-carmine and root tips, following hydrolizing in 1N HCl for ten minutes, were stained with aceto-orcein.

Taxonomy

Collections have been examined from the following herbaria (acronyms after Holmgren & Keuken, 1974): AD, BM, BRI, CANB, CBG, GH, K, KP (Kings Park, Western Australia), MEL, NSW, NT, PERTH and UWA.

RESULTS

P/O's and Anther Measurements

Table 1. Pollen-ovule ratios and anther characteristics of species of *Actinobole*.

Characteristic	Species	$\bar{x}$	S.D.	S.E.$\bar{x}$	Range	n	Populations
Pollen grains per floret (P/O)	A. drummondiana	1,944.1	366.2	49.3	1,282-2,876	55	15
	A. condensatum	304.2	103.4	15.09	144-508	47	7
	A. oldfieldiana	1,336.2	204.5	22.3	730-1,795	84	25
	A. uliginosum	110.5	31.5	1.8	36-200	307	64
Total anther length (mm)	A. drummondiana	0.95	0.072	0.01	0.8-1.18	48	10
	A. condensatum	0.6	0.059	0.008	0.49-0.77	51	10
	A. oldfieldiana	0.95	0.083	0.01	0.8-1.15	63	4
	A. uliginosum	0.48	0.074	0.005	0.27-0.65	205	12
Length of microsporangia (mm)	A. drummondiana	0.7	0.065	0.009	0.59-0.87	48	10
	A. condensatum	0.37	0.049	0.006	0.27-0.5	51	10
	A. oldfieldiana	0.66	0.06	0.007	0.52-0.86	63	4
	A. uliginosum	0.27	0.057	0.004	0.14-0.4	205	12
Length of terminal anther appendage (mm)	A. drummondiana	0.25	0.039	0.005	0.2-0.4	48	10
	A. condensatum	0.22	0.062	0.008	0.12-0.4	51	10
	A. oldfieldiana	0.27	0.051	0.006	0.15-0.42	63	4
	A. uliginosum	0.21	0.038	0.002	0.09-0.33	205	12

Measurements are summarised in Table 1 and Figure 2. They are referred to the species ultimately recognised.

In many cases populations within each species, when compared with each other, showed statistically significant differences in the various attributes examined. However population data obtained (housed in MEL) are not presented, as for the purposes of this paper the important factor is that population figures readily form distinct classes which allow the recognition of taxa.

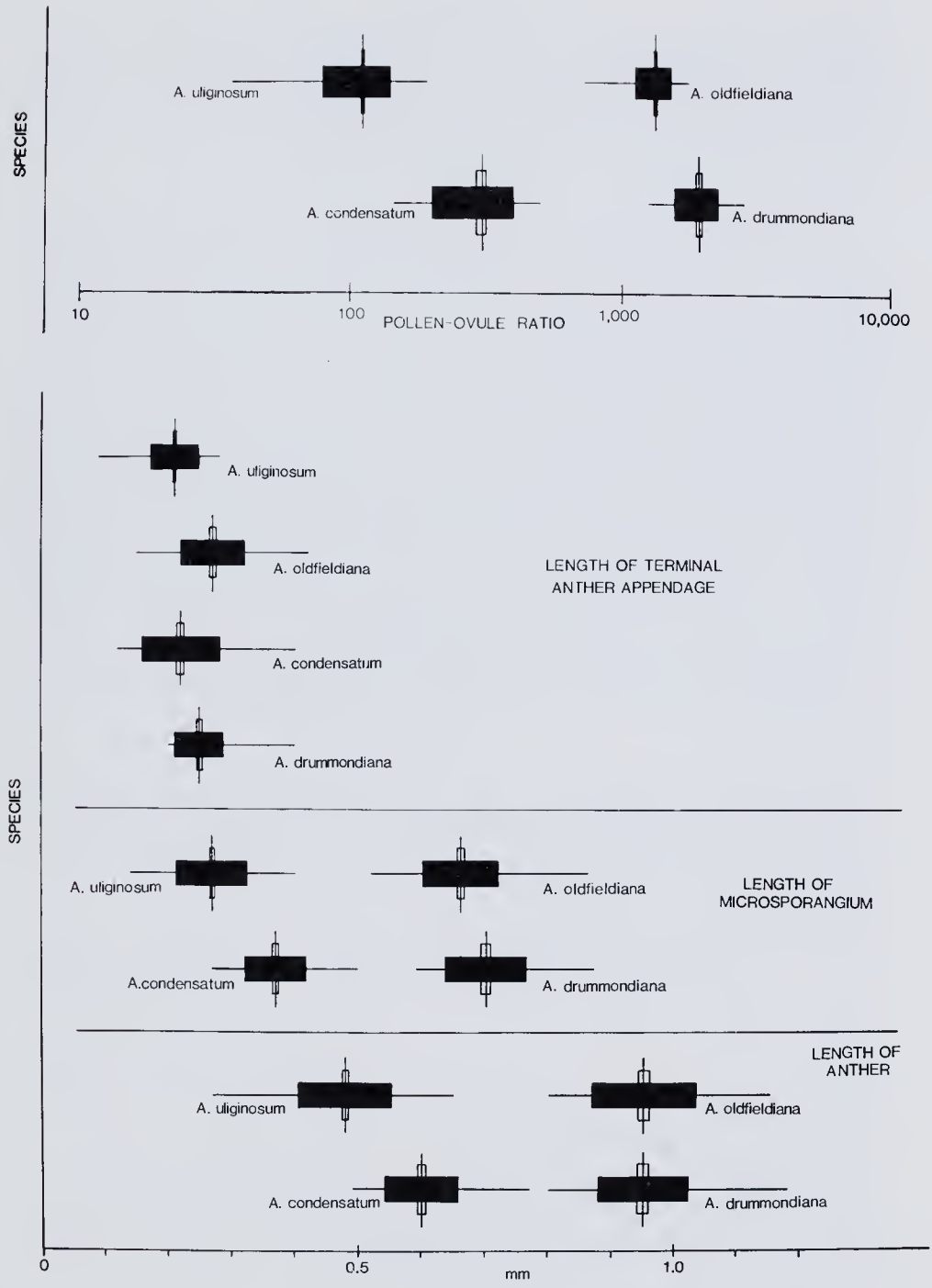

Fig. 2. Pollen-ovule ratios and anther characteristics of species of *Actinobole*.

CYTOLOGY

The only definite chromosome number determination obtained came from *Short 1540,* a collection subsequently referred to as *A. oldfieldiana*. Counts of n = 11 were recorded from three plants.

Root tip squashes of *A. uliginosum* s. str., from *Short 827,* were inconclusive. Two determinations, of 2n = c.22 and 2n = c.24, were obtained.

DISCUSSION

Cruden (1977) showed that pollen-ovule ratios (P/O's) are a conservative indicator of a flowering plant's breeding system. A number of papers (eg. Lloyd 1965; Cruden 1976a, b; Schoen 1977; Cruden & Hermman-Parker 1979; Spira 1980) support this contention. Within the Compositae they include Baker (1967, *Eupatorium*), Gibbs et al. (1975, *Senecio*) and Lloyd (1972, *Cotula*), although none of these authors actually records P/O's, ascertaining instead the floret sex ratio and/or the number of pollen grains per anther lobe, per anther or per floret. However in all cases it is clear that, if computed, there would be a strong correlation of P/O values with breeding systems. I (Short 1981) have similarly found that closely related species of native Australian Compositae can, on differences in P/O's, readily be classed as 'inbreeders' (i.e. taxa within which plants commonly self-pollinate; referred to herein as selfers or selfing taxa) or 'outbreeders' (i.e. taxa within which plants, although possibly self-compatible, commonly cross-pollinate; referred to herein as outcrossing taxa or outcrossers). In a further paper I (Short 1983) recognised two species of *Chrysocoryne* which, although sometimes differing in habit, were primarily recognised by the number of florets per capitulum, the number of corolla lobes per floret and in particular by anther size and P/O values. More recently Lawrence (1985), following experimental work, has found that P/O's and capitulum morphology reflect whether or not Australian species of *Senecio* are self-compatible or self-incompatible.

Although it may still be argued that more data should be obtained on the use of P/O's in reflecting breeding systems I again give the taxa recognised in this paper specific status because:

1. P/O determinations and anther sizes readily group together into discrete classes which allow the recognition of taxa. Pollen counts and measurements have been taken from a large number of populations and individuals, often scattered over wide areas. For example in *A. uliginosum* s. lat. at least one individual from each Western Australian collection was examined. Within that state all individuals from collections coming from an area between latitudes c.28°S. and c.30°S., that is the overlap zone of selfers and outcrossers of *A. uliginosum* s. lat., were examined.

Despite the fact that paired selfing and outcrossing taxa are sympatric (but with a narrow overlap), individuals with intermediate P/O values and anther sizes were not detected when the only mixed collections, *Short 559* (*A. uliginosum* s. lat.) and *Short 393* (*A. condensatum* s. lat.), were examined.

2. Other morphological differences apparently exist between taxa and are correlated with changes from high to low P/O values. Thus the selfing entity of *A. uliginosum* occasionally produces 4-lobed florets and not 5-lobed florets. Furthermore the alignment of pollen grains within the microsporangia suggests that the anthers of outcrossing taxa are tetrasporangiate, those of the selfing taxa bisporangiate.

3. The differences between taxa are consistent with those documented for other closely related species with different breeding systems (eg. see Ornduff 1969; Short 1981).

4. Recognition of taxa is easily accomplished under a dissecting microscope at c.40 times magnification. At this magnification it is usually a simple matter to discern whether or not there are few or many pollen grains and it is often not necessary to measure anthers. Hence the recognition of species is not impractical.

Thus *A. condensatum* s. lat. is considered to consist of *A. condensatum* (A. Gray) P. S. Short s. str. and *A. drummondiana* P. S. Short whereas *A. uliginosum* s. lat. is considered to consist of *A. uliginosum* (A. Gray) H. Eichler s. str. and *A. oldfieldiana* P. S. Short.

TAXONOMY

Actinobole Fenzl ex Endl., Gen. Pl. Suppl. 3:70 (1843); Walpers, Repertorium botanices systematicae 6:229 (1846); H. Eichler, Taxon 12:295 (1963); H. Eichler, Suppl. to J. Black's Fl. S. Aust. 327 (1965); P. S. Short in Jessop, Fl. Central Aust. 392 (1981); P. S. Short, Muelleria 4:413 (1981). — *Gnaphalodes* A. Gray, Hook. J. Bot. Kew Gard. Misc. 4:228 (1852), *nom. illeg.*, non *Gnaphalodes* Miller, Gard. Dict. Abr. 4th ed. (1754); Benth., Fl. Austr. 3:577 (1867), p.p. (excluding *G. filifolium* = *Siloxerus filifolius*); Benth. in Benth. & Hook. f., Genera Pl. 2:321 (1873); O. Hoffm. in Engl. & Prantl, Naturl. Pflanzenfam. 4(5):195 (1890), p.p.; F. M. Bail., Qd. Fl. 851 (1900); J. Black, Fl. S. Aust. 1st ed. 649 (1929), 2nd ed. 929 (1957); Grieve & Blackall, W. Aust. Wildfls 773, 823 (1975). NEOTYPE: *A. uliginosum* (A. Gray) H. Eichler [see *Taxon* 12:295 (1963)].

Annual herbs. Stem reduced, with entire plants consisting of a single inflorescence surrounded by a basal rosette of leaves or the stem forming major branches at or near basal nodes; major axes prostrate or ± decumbent, sometimes developing minor shoots, all axes hairy and terminating in an inflorescence. *Leaves* alternate or sometimes appearing opposite, sessile, spathulate or oblanceolate to obovate, tomentose. *Inflorescences* of 1 capitulum or of 2-10(12) capitula in a compact cluster; all inflorescences ± obloid to transversely ellipsoid or broadly depressed to depressed-ovoid and with a general involucre of leaves and leaf-like bracts which are c. the length of or up to c. 3 times the length of the capitula; general receptacle disc-like or slightly branched, hairy. *Capitular bracts* c. 20-30, usually hyaline but with a central green midrib extending for c. ⅔-¾ of its length, the upper part of the lamina often constricted or abruptly attenuated above the midrib, occasionally the entire, outermost bracts leaf-like except for a small, hyaline tip. *Outermost bracts* (the majority) ± lanceolate to ovate or ± oblanceolate or ± narrowly obtrullate to obtrullate, the lamina barely constricted or attenuated above the midrib, all bracts united by long hairs along the margins. *Middle bracts* ± oblanceolate to obovate or narrowly obtrullate to obtrullate, the upper part of the lamina (above the midrib) constricted, ± opaque, flat to curved, reflexed, all bracts united by long hairs at the constriction. *Inner bracts* ± oblanceolate to obovate or narrowly obtrullate to obtrullate or elliptic, the upper part of the lamina (above the midrib) constricted, ± opaque, flat to curved, reflexed, the bracts glabrous or with a few long hairs at the base of the constriction, all bracts free. *Partial receptacle* conical, glabrous. *Florets* bisexual, (7)20-50(63) per capitulum; corolla yellow, (4)5-lobed. *Style* branches truncate, with short sweeping hairs, a distinct stylopodium present. *Stamens* 5; anthers with a sterile apical appendage which is ± triangular and with an obtuse apex; microsporangia tailed, endothecial tissue polarized; filament collar ± straight in outline and composed of ± uniform cells and basally not thicker than the filament. *Achenes* ± obovoid, glabrous, brown and with a diaphanous epidermis which swells on wetting, the stylopodium persisting in mature fruit. *Pappus* consisting of (4)5(6) bristles which are fused at the base, each bristle tapering toward the apex and plumose for most of its length, sometimes ending in a shortly stalked, plumose tuft, the bristles c. the length of the floret tube and strongly reflexed when released from the capitulum.

Chromosome numbers: n = 10,11.

TYPIFICATION:

Actinobole Fenzl ex Endl. was described by Endlicher (1843) without reference to a species and the name applied was in a manuscript of Fenzl's (Walpers 1846). The generic description agrees well with the circumscription of *Gnaphalodes* A. Gray which was described in 1852 and included two species, *G. condensatum* and *G. uliginosum*. Subsequent workers (eg. Bentham 1873; Hoffmann 1894) felt that *Actinobole* and *Gnaphalodes* were possibly congeneric but presumably because of doubt over the application of the former name chose the more recent one, *Gnaphalodes*.

Eichler (1963) noted that *Gnaphalodes* A. Gray is illegitimate since it is a later homonym of *Gnaphalodes* Miller. He also found that apparently no specimens annotated as *Actinobole* by either Fenzl or Endlicher exist in Vienna (W) and thus the correct application of the name was still questionable. Despite this Eichler chose *Gnaphalodes uliginosum* as the neotype species of *Actinobole*, making the combination *A. uliginosum* (A. Gray) H. Eichler. As he pointed out, the conservation of *Gnaphalodes* A. Gray against *Gnaphalodes*

Miller and *Actinobole* does not seem warranted. I have since made the combination *A. condensatum* (A. Gray) P. S. Short (Short 1981) and, in this paper, attribute two new species to the genus.

DISTRIBUTION AND ECOLOGY (Fig. 3):

All four species of *Actinobole* occur in Western Australia. Three are restricted to that state but one, *A. uliginosum,* occurs throughout much of central and southern Australia.

All species of *Actinobole* possess an efficient method of achene dispersal. The pappus in all species usually consists of five stiff bristles which, in the intact capitulum, lie parallel to the corolla tube. As the capitular bracts weaken at maturity the pappus bristles suddenly reflex, shooting the fruits from the capitulum and dispersing them around the plant.

Habitat details are outlined under the respective species.

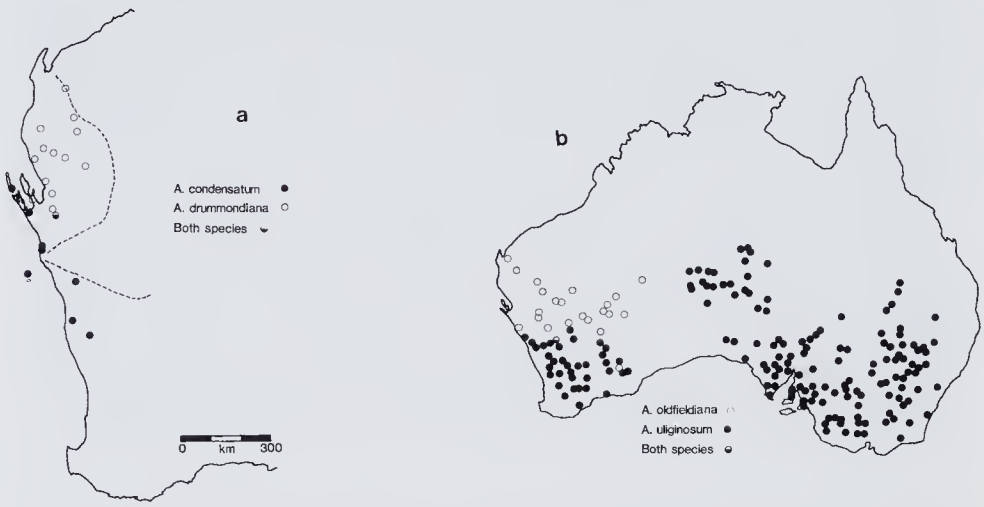

Fig. 3. Distribution of species of *Actinobole.* In fig. 3a the looped broken line represents the approximate western limit of *A. oldfieldiana* and the more or less straight broken line represents the approximate northern limit of *A. uliginosum.*

AFFINITIES /GENERIC CHARACTERISTICS:

Actinobole has commonly been placed in the tribe Inuleae, subtribe Angianthinae (Bentham 1867, 1873; Black 1929). The subtribe was first described by Bentham (1867). Taxa placed in the subtribe were said to be characterised by the possession of tubular, bisexual florets and, most importantly, the presence of "small, sessile or nearly so [capitula] on a common receptacle in dense clusters or compound heads, often closely surrounded by imbricate bracts or by a few floral leaves forming a general involucre" (p. 556).

In more recent times Merxmüller et al. (1977), placing much reliance on pollen structure, stylar structure of bisexual florets and chromosome numbers, suggested that only three subtribes be recognised within the Inuleae. They included the Angianthinae within the Gnaphaliinae, a subtribe incorporating the majority of Australian Inuleae. I agree with this classification. However Merxmüller et al. maintained an "*Angianthus* group" containing all members previously placed in the Angianthinae. As I have previously indicated (Short 1983) the maintenance of such a group is unacceptable. The group is clearly polyphyletic. For example within *Angianthus* s. lat. the majority of segregate genera recognised (Short l.c.) are themselves not obviously related, there being an array of unique bract and achene characteristics which clearly set them apart from one another.

A further problem with using the presence of compound heads as a criterion for grouping genera can be seen in *Actinobole, Eriochlamys* Sond. & F. Muell. ex Sond. and *Cephalipterum* A. Gray. Although the majority of individuals in these genera possess several

to many capitula per cluster, in all species there are some individuals with only single capitula.

Despite the above criticism of the use of compound heads in grouping species, their usual presence is a useful, albeit somewhat artificial, character for inclusion in keys. *Actinobole* itself is clearly distinguished from other genera with clustered capitula by the presence of usually five distinctive pappus bristles. Other attributes such as capitular bract morphology and arrangement and achene morphology, alone or in combination, may also be unique to this genus but further work on other members of the Inuleae is required before this can be ascertained.

Reproductive Biology & Evolution:

Pollen-ovule ratios and anther measurements suggest that *A. condensatum* s. lat. and *A. uliginosum* s. lat. each consists of two species. Furthermore the P/O ratios obtained suggest that two species, *A. uliginosum* s. str. and *A. condensatum* s. str. can be regarded as predominantly self-pollinating whereas *A. drummondiana* and *A. oldfieldiana* are more likely to be predominantly cross-pollinated. It also seems possible that the species with low P/O's were directly derived from those species with high P/O's. That is *A. uliginosum* has been derived from *A. oldfieldiana* and *A. condensatum* has been derived from *A. drummondiana*. Such directional changes have been documented for numerous species of flowering plants and are often correlated with other changes related to a plant's reproductive biology (see above discussion; Ornduff 1969; Short 1981).

Chromosome data has been obtained only for three species, *A. drummondiana* (n = 10; Turner 1970 as *Gnaphalodes condensatum* A. Gray, voucher *T5388*), *A. oldfieldiana* (n = 11) and *A. uliginosum* (2n = c. 22 or c. 24). The apparent close relationship with *A. oldfeldiana* suggests that 2n = 22 is most likely for the latter species. On current knowledge it also seems reasonable to suggest that the ancestral base number is x = 11, with aneuploid reduction giving rise to n = 10.

I have previously stated that *A. uliginosum* was possibly derived directly from *A. condensatum* s. lat. (Short, 1981). This was suggested on the basis of a generally less conspicuous inflorescence in *A. uliginosum,* its wide geographic distribution and the belief that, unlike *A. condensatum, A. uliginosum* consisted only of individuals with low P/O's. The additional data suggests that both *A. condensatum* s. lat. and *A. uliginosum* s. lat. may have been derived from an ancestral, cross-pollinating species (i.e. with a high P/O ratio) with a chromosome number of n = 11. Species with different breeding systems, i.e. low P/O's etc., subsequently evolved independently within *A. condensatum* s. lat. and *A. uliginosum* s. lat.

Factors resulting in the evolution of inbreeding and the causes and consequences of inbreeding have been discussed by numerous workers (see Short, 1981 for a brief summary). As all species of *Actinobole* occur in semi-arid and arid regions of Australia pollinator reliability and shorter life cycles are two factors which may be of importance in the evolution of inbreeding in this group.

Ideas relating to the origin of the Australian arid zone flora have been discussed recently by Barlow (1981) and Carolin (1981). Evidence suggests that arid areas, plus an eremean flora, have existed in Australia for at least 15 million years. Some workers (eg. Carolin, l.c.) have even suggested that arid regions have occurred in Australia since the break-up of Gondwanaland.

Although arid areas have existed for long periods of time it is tempting to suggest that both *A. uliginosum* and *A. condensatum* are, geologically speaking, recently derived species. There is an apparent lack of morphological changes (except for the occasional presence of 4-lobed florets and not 5-lobed florets in *A. uliginosum*) accompanying the changes observed in pollen grain number and anther morphology observed within *A. condensatum* s. lat. and *A. uliginosum* s. lat. The cycles of aridity known to have occurred in the past 400,000 years (Bowler, 1981) may have resulted in the change to inbreeding observed not only in *Actinobole* but also in other Australian Gnaphaliinae (Short 1981).

The evolution of chromosome races, often linked with changes in breeding systems, in various species of *Brachyscome* Cass. and *Calotis* R. Br. (Compositae: Astereae) have also been linked with climatic changes in the late Pleistocene and Recent times (Kyhos et al., 1977; Stace, 1981).

KEY TO SPECIES OF ACTINOBOLE

1. Leaves and leaf-like bracts of the general involucre usually c. 1.5-3 times the length (rarely about the length) of the capitula; the upper part of the lamina of the middle capitular bracts narrow and tapering to a ± acute apex (Fig. 4)
   2. Anthers < 0.8 mm long; pollen grains < 600 per floret and < 100 per anther ..... 1. *A. condensatum*
   2. Anthers > 0.8 mm long; pollen grains > 1200 per floret and > 200 per anther .... 2. *A. drummondiana*
1. Leaves and leaf-like bracts of the general involucre about the length of the capitula; the upper part of the lamina of the middle capitular bracts ± rounded at the apex (Fig. 4)
   3. Mature achenes dark green ..... 4. *A. oldfieldiana*
   3. Mature achenes brown
      4. Anthers < 0.7 mm long; pollen grains ⩽ 200 per floret and ⩽ 40 per anther ..... 3. *A. uliginosum*
      4. Anthers ⩾ 0.8 mm long; pollen grains > 700 per floret and > c. 200 per anther .. 4. *A. oldfieldiana*

1. **Actinobole condensatum** (A. Gray) P. S. Short, Muelleria 4:413 (1981). — *Gnaphalodes condensatum* A. Gray, Hook. J. Bot. Kew Gard. Misc. 4:228 (1852); Benth., Fl. Austr. 3:578 (1867); Grieve & Blackall, W. Aust. Wildfls 824 (1975). TYPE: "Swan River, *Drummond.*" LECTOTYPE (here designated): *Drummond 863,* Chrysodiscus ? Steetz. Pappus equaleis 5 — apice . . plumosis. Sw. riv., s. dat. (K). SYNTYPES, ISOSYNTYPES OR PROBABLE ISOLECTOTYPES: *Drummond s.n.,* Swan R., s. dat. (GH); *Drummond 363,* s. dat. (BM, MEL).

Annual herb. Stem reduced and unbranched or forming major branches at basal nodes; major axes prostrate to ± decumbent, 2-5(11) cm long, sometimes developing minor shoots, all axes hairy and terminating in an inflorescence. *Leaves* ± spathulate or ± oblanceolate to obovate, 1-3(3.2) cm long, (0.15)0.2-0.5(0.6) cm wide, tomentose, the upper surface less hairy and greener than the grey-green undersurface. *Inflorescences* of 1 capitulum or of 2-c. 20 capitula in a compact cluster, all inflorescences ± obloid to transversely ellipsoid or broadly depressed to depressed-ovoid, 0.5-1.2 cm high, (0.6)1-1.8 cm diam. and surrounded by a general involucre of leaves and leaf-like bracts, the largest ones c. 1.5-3 times the length of the capitula, rarely about the length of the capitula, all bracts tomentose. *Capitular bracts* 23-28. *Outermost bracts* ± narrowly obtrullate or ± oblanceolate, 3.7-6.4 mm long, 0.5-2.1 mm wide. *Middle bracts* ± narrowly obtrullate to obtrullate or ± obovate, 4-6.7 mm long, 1.2-2.8 mm wide; upper part of the lamina 1.2-2 mm long, ± flat, narrow and tapering to a ± acute apex, yellow or yellow-brown. *Inner bracts* ± obovate, ± obtrullate or sometimes ± elliptic, 4.2-7.7 mm long, 1.3-2.1 mm wide; upper part of the lamina 1.1-1.6 mm long, broader than in the middle bracts, rounded, ± flat to concave. *Florets* 20-40 per capitulum; corolla tube 2.3-2.8 mm long, 5-lobed. *Stamens* 5. *Anthers* possibly bisporangiate, (0.49)0.55-0.65(0.77) mm long; apical appendage (0.12)0.16-0.35(0.4) mm long. *Pollen grains* (144)160-460(508) per floret, (8)20-80(c. 100) per anther. *Achenes* ± obovoid, 0.9-1.1 mm long, 0.5-0.6 mm diam. *Pappus* consisting of (4)5(6) bristles fused at the base, each bristle tapering towards the apex and plumose for most of its length but ending in a shortly stalked plumose tuft.

TYPIFICATION:

Gray (1852) described the species of *Gnaphalodes* from collections made by James Drummond in Western Australia and forwarded to Gray by Sir William Hooker. Unfortunately Gray did not record the collection number(s) provided by Drummond although undoubted duplicate collections viewed by him and housed in K are numbered. Thus the collection *Drummond 863*, with the name *Gnaphalodes condensatum* apparently in Gray's hand, is regarded as a type collection. I have chosen it as the lectotype because the only material of *G. condensatum* at GH is fragmentary, consisting of florets and capitular bracts contained in a single envelope. Written on the envelope, in Gray's hand, are the words "Gnaphalodes n. gen. Debris examined of the 2 species. Swan R. Drummond." This envelope was contained in a further one with the words, again apparently in Gray's hand, "Gnaphalodes. Gray." Material of both species is generally recognisable and I have sorted and placed the fragments of each species in separate bags within the outer envelope. The syntype collection at GH is regarded as a probable isolectotype.

The collections of *G. condensatum* at BM and MEL can be regarded variously as syntypes, isosyntypes or isolectotypes. They lack any indication that they were examined by Gray and therefore may not be syntypes. However they generally resemble the lectotype

specimen and also have Drummond's original collector's number, *363,* attached to them. I suspect that this number should also apply to the lectotype collection at K, a collection which lacks an original collector's tag. In his description in *Flora Australiensis* the only Drummond collection cited by Bentham (1863, p. 578) was *'Drummond, 5th Coll. n. 363',* further suggesting that the number *'863'* was erroneously added to the lectotype sheet.

DISTRIBUTION (Fig. 3):

Confined to Western Australia between latitudes c. 24°S and 30°30′ S and west of longitude c. 116°E. It has been collected from several off-shore islands, namely Dirk Hartog Island and North, West Wallabi and East Wallabi Islands in the Houtman Abrolhos. It is partly sympatric with its close relative *A. drummondiana* and a single collection, *Short 393,* containing individuals of both species has been gathered c. 100 km north of the Murchison River bridge along the North West Coastal Highway. Individuals were intermixed, i.e. there were no apparent ecological preferences exhibited by the two species.

ECOLOGY:

A. condensatum tends to grow only in sand. Collector's notes include "In rocky limestone soil", "In sand over limestone, on low heath", "Open scrub . . . *Acacia blakelyi* and *Banksia prionotes.* Soil: deep orange brown sand over limestone", "In red sandy soil with *Eucalyptus loxophleba",* "Growing in white-brown sand in open areas with *Calocephalus francisii* and other herbs between *Carpobrotus, Acacia* and other shrubs" and "Low scrub of *Acacia,* proteaceous shrubs and *Labichea.* Deep yellow sand".

SELECTED SPECIMENS EXAMINED (Total c. 21):

Western Australia — Corrick 8133, Kalbarri National Park . . . between Red Bluff and Park boundary, 21.ix.1982 (HO, MEL); *George 11409,* 5 km N. of C. Ransonnet, Dirk Hartog Island, 2.ix.1972 (PERTH); *Griffin 3027 & Blackwell,* 20 km SW. of Eneabba, 27.ii.1981 (PERTH); *Short 1604,* c. 3 km SW. of Ardingly, 1.ix.1982 (MEL).

2. **Actinobole drummondiana** P. S. Short, sp. nov.

Ab *A. condensatum* antheris (0.8)0.85-1.1(1.18) mm longis, omnibus flosculis pollinis granis (1,282)1,400-2,600(2,876), omnibus antheris pollinis granis c. 280-520 differt.

HOLOTYPUS (Fig. 4c): *Short 417,* Western Australia. c. 28 km S. of Overlander Roadhouse on NW. coastal highway (26°38′ S, 114°33′ E). Red sand; dominants incl. *Ptilotus obovatus, Acacia tetragonophylla* & other *Acacia* sp., 20.viii.1977 (AD 97742617). ISOTYPI: AD (wet colln), MEL, PERTH.

The species is apparently indistinguishable from *A. condensatum* on characters other than those outlined above. Collections of *A. drummondiana* tend to consist of larger, more robust individual specimens than do those of *A. condensatum.* However this is probably just a reflection of sampling and of variable environmental parameters.

A. drummondiana has a chromosome number of n = 10 (Turner 1970).

DISTRIBUTION (Fig. 3):

Confined to Western Australia between latitudes c. 22°30′ S and c. 27°S and west of longitude c. 115°30′ E. (Also see note on distribution under *A. condensatum).*

ECOLOGY:

A. drummondiana appears to grow only in sand. Collectors' notes include "Dry sandy bed of river channel", "Red sand dunes — dominant *Acacia linophylla",* and "Growing in sand in open areas between shrubs of *Hakea, Acacia* & chenopods. Associated with various ephemeral herbs including *Gnephosis brevifolia, G. gynotricha* and *Pogonolepis* sp.".

NOTE:

1. The specific name commemorates James Drummond. Among his numerous collections are the types of *A. condensatum* and *A. uliginosum.*

SELECTED SPECIMENS EXAMINED (Total c. 22):

Western Australia — Burbidge 6464, Woodleigh Station, 2.ix.1959 (CANB, PERTH); *Short 1552,* c. 1 km

N. of Boologooro Homestead, 25.viii.1982 (MEL); *Short 2032,* c. 14 km SE. of Carnarvon, 12.x.1983 (MEL); *Turner 5388,* 26 miles E. of Gascoyne Junction, 22.viii.1965 (MEL, PERTH).

3. **Actinobole uliginosum** (A. Gray) H. Eichler, Taxon 12:295 (1963); H. Eichler, Suppl. to J. Black's Fl. S. Aust. 327 (1965); J. H. Willis, Handb. Fl. Vict. 2:732 (1973); Short in Jessop, Fl. Central Aust. 392, fig. 504 (1981); Short, Muelleria 4:399 (1981); Cunningham, Mulham, Milthorpe & Leigh, Pl. Western N.S.W. 711 (1982) — *Gnaphalodes uliginosum* A. Gray, Hook. J. Bot. Kew Gard. Misc. 4:228 (1852); Benth., Fl. Austr. 3:578 (1867); F. M. Bail., Qld. Fl. 851 (1900); J. Black, Fl. S. Aust. 1st ed. 649, fig. 306 (1929), 2nd ed. 930, fig. 1232 (1957); Grieve & Blackall, W. Aust. Wildfls 823, pl. 13 (1975) p.p. (excluding collections of *A. oldfieldiana*). TYPE: "Swan River, *Drummond.*" LECTOTYPE (here designated): *Drummond 69,* Swan River, N. Holl., s. dat. (K). PROBABLE ISOLECTOTYPE: *Drummond s.n.,* Swan R., s. dat. (GH). POSSIBLE SYNTYPES OR ISOSYNTYPES: *Drummond 360,* Sw. riv., s. dat. (K); *Drummond 369 or ?360,* s. dat. (BM); *Drummond s.n.,* W.A., s. dat. (MEL 83399). See typification, note 1, below.

Gnaphalodes evacinum Sond., Linnaea 25:520 (1853); Schdl., Linnaea 21:450 (1848), description but no name. TYPE: "Lyndoch-Valley, in solo sterili gregatim crescens, Sept., Octob." LECTOTYPE (here designated): *Mueller s.n.,* Lyndoch Valley, s. dat. (GH, ex herb. Sonder, ex herb. Klatt). POSSIBLE ISOLECTOTYPES, SYNTYPES OR ISOSYNTYPES: *Mueller s.n.,* Lyndoch-valley, N. Holl. austr., — .ix.1851 (MEL 544152); *Mueller s.n.,* In den nördlicheren districten stellenweise auf unfruchtbarem boden, oft in dichtgesäeten massen. Sept. Oct. (MEL 84384, ex herb. Sonder); *Mueller s.n.,* In . . . madidis . . . arenosis prope Lyndoch valley, — .ix.?1851 (MEL 84321); *Mueller s.n.,* Murray, s. dat. (K). See typification, note 2, below.

Annual herb. Stem reduced and unbranched or forming major branches at basal nodes; major axes prostrate to ± decumbent, c. 1-10 cm long, sometimes developing minor shoots, all axes hairy and terminating in an inflorescence. *Leaves* ± spathulate or oblanceolate to obovate, 0.3-1(1.3) cm long, 0.15-0.5 cm wide, tomentose, the under surface sometimes more hairy than the upper surface. *Inflorescences* of 1 capitulum or of 2-12 capitula in a compact cluster, all inflorescences ± obloid to transversely ellipsoid or broadly depressed to depressed-ovoid, c. 0.5-1 cm high, c. 0.6-1.8 cm diam. and surrounded by a general involucre of leaves and c. 15-20 leaf-like bracts which are oblanceolate to obovate, 0.3-0.9 cm long, c. 0.1-0.45 cm wide, the largest ones about the length of the head, all bracts tomentose. *Capitular bracts* c. 19-28. *Outermost bracts* ± oblanceolate to obovate or ± obtrullate, sometimes ± elliptic or ± ovate, 3.8-4.4 mm long, (0.8)1-1.7 mm wide. *Middle bracts* ± obtrullate or ± obovate, 3.7-4.9 mm long, 1.7-2 mm wide; upper part of the lamina 1-1.3 mm long, ± flat to concave, ± rounded at the apex, yellow. *Inner bracts* ± oblanceolate to obovate or narrowly obtrullate to obtrullate, sometimes ± elliptic, 3.2-4.6 mm long, 1.1-1.8 mm wide; upper part of the lamina (0.5)0.8-1.2 mm long, ± rounded at the apex, yellow. *Florets* (28)35-55(63) per capitulum; corolla tube 2-2.5 mm long, (4)5-lobed. Stamens (4)5. *Anthers* possibly bisporangiate, (0.27)0.34-0.62(0.65) mm long; microsporangia (0.14)0.16-0.37(0.4) mm long; apical appendage (0.09)0.1-0.25(0.33) mm long. Pollen grains (36)48-180(200) per floret, (4)8-36(40) per anther. *Achenes* ± obovoid, c. 0.75-0.85 mm long, 0.4-0.45 mm diam. Pappus consisting of 5 bristles fused at the base, each bristle tapering toward the apex and plumose for most of its length, sometimes with a ± terminal tuft.

Chromosome number: n = c. 11.

TYPIFICATION:

1. Gray failed to record Drummond's collection number or numbers in both his publication and on type material (fragmentary and mixed with *G. condensatum* — see under that species) at GH. At K undoubted syntype material exists on a sheet containing four separate collections of *A. uliginosum*. Two of these collections were made by Drummond. One of these, *Drummond 69,* consists of a single plant, is labelled in Gray's hand as *Gnaphalodes uliginosum* and must be selected as the lectotype because there is no indication that Gray examined the other Drummond collection, *Drummond 360. Drummond 360* can only be regarded as a possible syntype. I regard the fragmentary material

at GH as a probable duplicate, i.e. an isolectotype, of *Drummond 69,* not of *Drummond 360.*

At BM there is a Drummond collection with an original collector's tag. The number on the tag can be interpreted as either *'360'* or *'369'.* It is presumably a duplicate of the K collection labelled, perhaps erroneously, as *Drummond 360.* There is no indication that Gray saw the specimen and thus this collection must be regarded only as a possible syntype or possible isosyntype.

The collection MEL 83399 could perhaps be regarded as an isosyntype or syntype. It contains a number of small plants of *A. uliginosum* and is accompanied by a label with the words "W.A., J. Dr." indicating that it is a collection by Drummond. However the specimens are not a good match with other type material, there is no indication that they were seen by Gray and I think it possible that the label has been erroneously placed with the specimens.

2. Sonder based his description of *Gnaphalodes evacinum* on specimens gathered and sent to him by Mueller. At MEL there are probably three sheets containing type material of *G. evacinum.* The information on one, MEL 544152, complies well with the published notes, giving the location as Lyndoch Valley and the date as September 1851. The label is in Mueller's hand. However there is no indication that this material was examined by Sonder. Another sheet, MEL 84384 (ex herb. Sonder), almost undoubtedly contains type material but unfortunately the labels and specimens on this sheet are mixed. Sonder's handwritten description is placed at the top of the sheet. Below this are two envelopes containing specimens. Only one envelope is labelled, i.e. with Mueller's unpublished manuscript name and the locality "Murray". Two individual plants are mounted below the envelopes and two original labels occur in the bottom right hand corner. One label records "Gnaphalodes evacinum Sonder. Murray. Dr. F. Mueller." The other, cited above, records "in the more northern districts, here and there on barren ground, often in densely crowded masses" (English translation by D. Sinkora, 28.vii.1982). The latter label does not record that the specimen comes from the Lyndoch Valley but in other respects the information is more or less in accord with that published by Sonder. The remaining sheet, MEL 84321, also apparently contains mixed labels and specimens. There are two cellophane bags, each containing specimens of *A. uliginosum.* Three labels, not directly referred to the specimens, occur on the sheet. One refers to the Lyndoch Valley collection and is cited above. The remaining labels refer to the locality as the Murray scrub and the date on one is given as October 1848.

Perhaps when describing *G. evacinum* Sonder had material from both the Lyndoch Valley and the Murray scrub. This may well explain the presence of apparently quite different labels on MEL 84321 and MEL 84384. However in the original description there is only reference to the Lyndoch Valley and only this material can be used for purposes of lectotypification. As the labels and specimens are not clearly matched on these two MEL sheets and because there is no indication that the collection MEL 544152 was examined by Sonder, the collection chosen as the lectotype is that held in GH. It consists of two plants, was originally obtained by Klatt from Sonder, and the accompanying label is in Sonder's hand.

Another collection labelled as *G. evacinum* and collected by Mueller from the "Murray" also exists in K and is tentatively considered to be a syntype or isosyntype.

Distribution (Fig. 3):

Widely distributed across much of mainland Australia, occurring between latitudes c. 23°S and c. 38°S and west of longitude c. 151°E in central and eastern Australia and in Western Australia south of latitude c. 28°S. It is partly sympatric with its close relative *A. oldfieldiana* and a single collection, *Short 559,* containing individuals of both species has been gathered near Paynes Find, Western Australia.

Ecology:

A. uliginosum occurs in an array of habitats. Collector's notes include *"Acacia aneura — Codonocarpus* open woodland on brown-red sand; broad swale between dunes, area surrounding small granite rock. Common in depressions, bare but for small herbs", "As-

sociated with *Acacia aneura* & scattered shrubs on hard, rocky, red clay-loam soil", "In red sand, on low sand hill near clay pan", "Open woodland of *Casuarina* & *Callitris* with scattered *Hakea*", "Growing in granitic depressions with various small annual grasses, composites etc. Sandy loam", "Growing in brown loam amongst *Eucalyptus, Acacia* et al shrubs and extending into upper *Arthrocnemum* [= *Halosarcia*] zone around salt lake", "Sandridge dominated by *Dodonaea* & mallee *Eucalyptus*. Associated with grasses & various herbs including *Wahlenbergia, Reichardia tingitana, Podolepis capillaris, Angianthus tomentosus* & *Pimelea trichostachya*", "Low scrub of *Acacia,* Proteaceous shrubs and *Labichea*. Deep yellow sand" and "Growing in red-brown loam in *Dodonaea* — *Ptilotus* shrubland".

Selected Specimens Examined (Total c. 350):

Western Australia — *Preiss 2415,* Swan River Colony, s. dat. (MEL 84256, MEL 84296); *Short 940,* Yorkrakine Granite Rocks, 13.xi.1979 (AD); *Short 1031,* Salt lake c. 21 km N. of Wongan Hills on main road to Kondut, 20.xi.1979 (AD); *Short 1606,* c. 3 km SW. of Ardingly, 1.ix.1982 (MEL); *Short 1760,* Eastern edge of Fraser Range, c. 32.5 km west of Newman Rocks turnoff along Western Highway, 19.ix.1982 (MEL).

Northern Territory — *Latz 3176,* Ooraminna Rockhole, 7.viii.1972 (CANB, NT); *Nelson 1734,* 1 mile S. Heavitree Gap, 15.viii.1968 (AD, CANB, NT).

South Australia — *Barker 3478,* c. 10 km NNE. of Mt. Kintore summit, 10.ix.1978 (AD); *Short 779,* Podinna Rock, 24.ix.1978 (AD); *Short 827,* c. 6 km SW. of Pt. Julia, 26.x.1978 (AD).

Queensland — *Clemens s.n.,* Charleville, — .ix.1945 (BRI 224710); *Pedley 2436,* 20 miles W. of Cunnamulla, 8.ix.1967 (BRI).

New South Wales — *Corrick 7288,* near Mt. Robe, 29.viii.1981 (MEL); *Muir 5840,* 2 km S. of Tapio Station, 30.viii.1978 (MEL).

Victoria — *Corrick 6689, Short & Fuhrer,* 30.6 km SE. of Walpeup on road to Patchewollock, 1.x.1980 (MEL); *Short 1245,* Sandridge above major saline region on western edge of Raak Plain, 27.ix.1981 (MEL).

4. **Actinobole oldfieldiana** P. S. Short, sp. nov.

Ab *A. uliginosum* antheris (0.8)0.85-1.1(1.15) mm longis, omnibus flosculis pollinis granis (730)1,000-1,600(1,795), omnibus antheris pollinis granis c. 200-320 differt.

Holotypus (Fig. 4a): *Short 1586,* Western Australia. c. 100-150 m above the river bed and c. 400 m downstream of the Murchison River bridge on the North West coastal highway. (27°49′ S, 114°40′ E). In *Acacia* scrub. Brown loam amongst granite rocks. 31.viii.1982 (MEL). Isotypi: AD, MEL (wet colln), PERTH.

The species is generally indistinguishable from *A. uliginosum* on characters other than those outlined above. However there are a number of collections, i.e. *Helms s.n.* (AD 96323023, NSW 138815), *Barker 2150, Short 515,* that are atypical in that the mature achenes are olive green instead of the usual brown. This difference is to some extent correlated with a difference in capitular bract morphology and this correlation is particularly apparent in the Helms collections from the Fraser Range (Fig. 4b). On the other hand *Short 477,* which lacks mature achenes is somewhat intermediate in capitular bract morphology between *Helms s.n.* and typical *A. oldfieldiana*. Further investigations may show that the collections with green achenes should be regarded as a distinct taxon but for the time being they are incorporated under *A. oldfieldiana*.

Distribution (Fig. 3):

Restricted to Western Australia between latitudes c. 22°30′ S and 29°30′ S and west of longitude c. 126°E. (Also see note on distribution under *A. uliginosum*).

The collections with green achenes have a scattered distribution (see list below of specimens examined) and one, *Helms s.n.*, from the Fraser Range has a somewhat disjunct distribution when compared with the total distribution of *A. oldfieldiana*.

Ecology:

Few notes on the habitat of *A. oldfieldiana* have been recorded. Collector's notes include "Lateritic outcrop. Growing in rocky places", "Sandy clay flat", "Red loamy soil", "In red loam near creek-line in mulga", "Coarse red sand" and "Open mulga scrub. In loam with ironstone gravel surface".

Individuals with inflorescences consisting of single capitula tend to be more common in *A. oldfieldiana* than in any other species. To some extent this appears to be an envi-

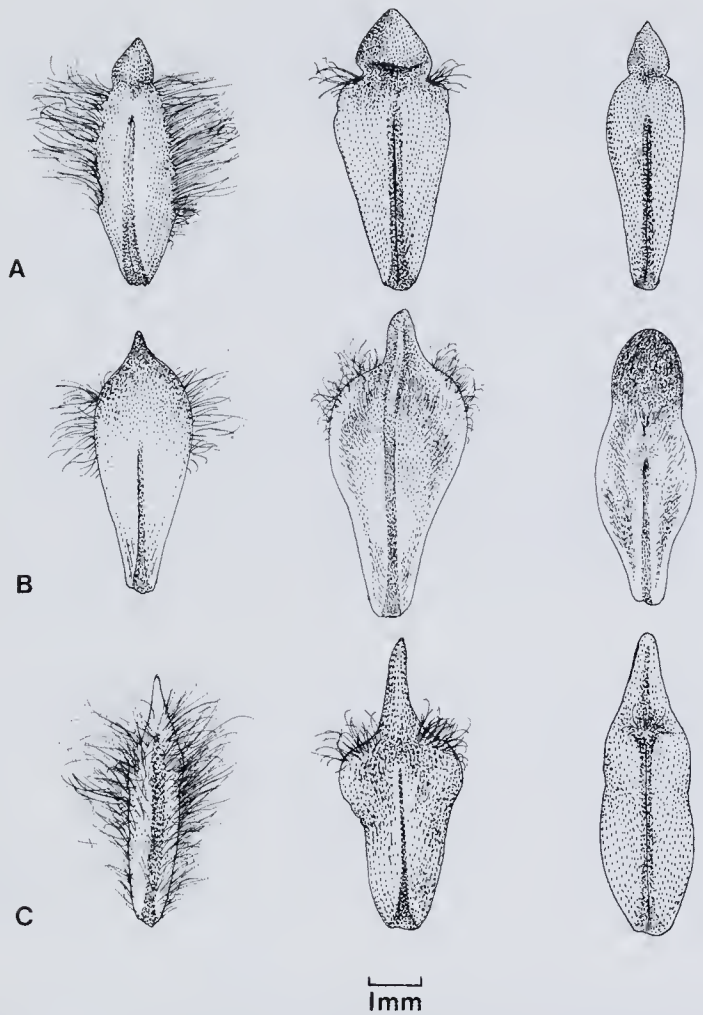

Fig. 4. Capitular bracts (outer, mid & inner) of *Actinobole*. a — *A. oldfieldiana (Short 1586)*. b — *A. oldfieldiana (Helms s.n.*, NSW 138815). c — *A. drummondiana (Short 417)*.

ronmental difference. In the collection *Short 1540* I recorded that single headed specimens grew in the open, the few-headed and less mature specimens in more shaded areas.

NOTE:

1. The species name commemorates Augustus Frederick Oldfield who collected extensively in Tasmania and Western Australia last century.

SELECTED SPECIMENS EXAMINED (Total c. 42):

Western Australia — Barker 2150, Yannarie River crossing, Barradale Roadhouse, 30.viii.1977 (AD, green fruit); *Chinnock 730,* 16 km S. of 10 Mile Tank on Bendya — Banjiwarn road, 3.ix,1973 (AD); *Donner 4501,* c. 135 km SW. of Warburton Mission, 30.viii.1973 (AD); *George 5387,* 4 miles E. of Mt. Beadell, 25.viii.1963 (PERTH); *Helms s.n.*, Fraser Range, 4.x.1891 (AD 96323023, NSW 138815, green fruit); *Short 477,* near Lyndon River Homestead, 25.viii.1977 (AD); *Short 515,* c. 1.9 km N. of Errabiddy on main road to Landor homestead, 11.ix.1977 (AD, green fruit); *Short 1540,* c. 18 km from Bandya homestead along road to Laverton, 21.viii.1982 (MEL); *Short 2119,* c. 17 km N. of Murchison River Bridge along the North West Central Highway, 18.x.1983 (MEL).

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A REVISION OF THE GENUS LABICHEA Gaudich. ex DC. (CAESALPINIACEAE)

by

J. H. Ross *

ABSTRACT

Ross, J. H. A revision of the genus *Labichea* Gaudich. ex DC. (Caesalpiniaceae). *Muelleria* 6 (1):23-49 (1985). — The endemic Australian genus *Labichea* Gaudich. ex DC. is revised. Fourteen species are recognized of which *L. deserticola, L. obtrullata, L. saxicola* and *L. stellata* are described as new. Infraspecific taxa are recognized formally in *L. lanceolata* and *L. teretifolia*. Descriptions, a key to the identification of species, illustrations and distribution maps are provided, together with notes on ecological preferences and relationships.

INTRODUCTION

Labichea, a genus of 14 species, was described by A. P. De Candolle, Prodr. 2:507 (1825), who adopted the name proposed by C. Gaudichaud to commemorate J. J. Labiche, an officer of the French ship Uranie who accompanied Freycinet and died during the latter's voyage around the world from 1817-20. The genus has a disjunct distribution in Australia occurring in Western Australia from the vicinity of the Ashburton River southwards and south-eastwards to Israelite Bay with outliers as far afield as the Victoria Desert, in the northern portion of the Northern Territory, and in northern, eastern and south-eastern Queensland (see Fig. 1).

Fig. 1. The distribution of the genus *Labichea*.

Labichea is a member of the tribe Cassieae Bronn and, together with *Petalostylis* R. Br., constitutes the sub-tribe Labicheinae Irwin & Barneby. *Petalostylis* differs from *Labichea* in having the style dilated into a boat-shaped petaloid limb, 3 fertile stamens opposed to the 3 abaxial sepals and 2 staminodes opposed to the adaxial sepals.

The Labicheinae have imparipinnate, digitate or unifoliolate leaves, distichous phyllotaxy, functionally 2 or 3-merous androecia and seed funicles dilated into a conspicuous aril. In contrast *Cassia* L. and segregate genera (sub-tribe Cassiinae) have the leaves paripinnate, phyllotaxy mostly spiral (when distichous the androecium is 5-10-merous) and the funicle either filiform or deltately dilated but without an aril.

Members of *Labichea* are xeromorphic shrubs or subshrubs. The leaves are either imparipinnate or by reduction digitate or unifoliolate and the leaflets are usually distinctly pungent-pointed. The pubescence is often of mixed hair types and sometimes varies on different parts of the same plant but at least some organs of each species bear distinctive short uncinate hairs. These uncinate hairs are either erect or they are bent shortly above their point of attachment and lie almost horizontal to the surface or are inclined at an angle of about 45°. The uncinate hairs form an understorey to longer spreading hairs, occur

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scattered in amongst appressed hairs or occur exclusively. Sometimes, especially on the upper leaflet surfaces, the uncinate hairs have bulbous bases which persist after the hairs have been shed and impart a scabrid texture to the surface. The pods of all species examined except *L. buettneriana* are clothed with a mixture of short erect uncinate hairs and scattered longer appressed or spreading hairs. Although uncinate hairs are a feature of *Labichea* species, they also occur sporadically on the pods of at least one species of *Petalostylis*.

The two anthers in *Labichea* flowers are either more or less uniform in size or one is almost twice as long as the other, a distinction which enables the species to be divided into two groups. However, although the species may be divided on this basis, the resulting groups are not homogeneous within themselves. The group with heteromorphic anthers, which contains the type of the genus, is the larger, more widely distributed and probably as a consequence the more heterogeneous group. The three species with imparipinnate leaves belong in this group, one in Western Australia and two in Queensland, but they do not appear to be at all closely allied. Of the others, *L. obtrullata* is clearly closely allied to *L. lanceolata* which in turn is allied to *L. nitida* and *L. saxicola*. Three of the four species in the group with uniform anthers show affinities but *L. punctata* with consistently unifoliolate leaves appears to occupy an isolated position.

The anthers dehisce by vertical slits or apical pores and some variation in the shape and position of the pores exists among the different species. In *L. stellata*, for example, the apices of the terminal pores diverge slightly on opening whereas in other species the pores are more or less V-shaped.

The pods and/or seeds of several species are unknown. Where known, the pods and seeds are relatively uniform except in *L. buettneriana* where the pods lack the characteristic uncinate hairs.

TAXONOMY

Labichea Gaudich. ex DC., Prodr. 2:507 (1825); Gaudich. in Freycinet, Voy. Uranie 485, t. 112 (1830); G. Don, Gen. Syst. 2:433 (1832); Benth., Fl. Austral. 2:292 (1864); Benth. in Benth. & Hook. f., Gen. Pl. 1:573 (1865); Taub. in Engl. & Prantl, Nat. Pflanzenfam. 3, 3:156 (1892); Hutch., Gen. Flow. Pl. 1:231 (1964); Irwin & Barneby in R. M. Polhill & P. H. Raven (eds), Advances in Legume Systematics 1:106 (1981). TYPE: *L. cassioides* Gaudich. ex DC.

Shrubs or subshrubs. Leaves imparipinnate or by reduction digitate or unifoliolate; leaflets usually coriaceous, sometimes rigid, mostly pungent-pointed. *Stipules* usually small and soon deciduous, sometimes persisting. *Inflorescence* a loose axillary raceme, sometimes few-flowered; pedicels ebracteolate. *Flowers* bisexual, irregular; bracts deciduous. *Sepals* 4 or 5, imbricate, the outer 2 larger, concave, the outermost sometimes slightly cucullate apically, the inner 2(3) more petal-like. *Petals* 4 or 5, yellow, the adaxial one usually with a red basal flare, the vexillar one interior in bud, unequal. *Stamens* 2, opposed to the 2 abaxial sepals; filaments much shorter than the anthers; anthers either more or less the same size or one almost twice as long as the other, dehiscing by vertical slits or apical pores. *Ovary* usually shortly stipitate, free, mostly 2-3-ovulate; style filiform; stigma terminal, small. *Pods* mostly oblong-elliptic, compressed, dehiscing along both sutures and the valves coiling. *Seeds* slightly compressed, the funicle dilated into a conspicuous globular aril which sometimes partly envelopes the base of the seed.

KEY TO SPECIES

1. Anthers unequal, one very much longer than the other:
   2. Leaves imparipinnately 3-17-foliolate:
      3. Lower surface of leaflets glabrous or with scattered appressed hairs, especially on the midrib ..... 1. *L. cassioides*
      3. Lower surface of leaflets densely clothed with appressed or spreading hairs:
         4. Leaf-rhachis 0.5-1.5 cm long; the terminal leaflet of each leaf disproportionately larger than the others; leaflets narrowed apically to a distinct pungent point ..... 2. *L. brassii*
         4. Leaf-rhachis (0.5)1.5-9 cm long; the terminal leaflet of each leaf larger than the others but not disproportionately so; leaflets rounded or obtuse apically and emarginate or slightly apiculate ..... 3. *L. buettneriana*
   2. Leaves unifoliolate or digitately 3-9-foliolate:

5. Leaves unifoliolate or consistently 3-foliolate:
   6. Leaves unifoliolate ..... 9. *L. lanceolata*
   6. Leaves 3-foliolate:
      7. Central leaflet of each leaf usually > 3 cm long and disproportionately longer than the lateral leaflets:
         8. Lateral leaflets elliptic or elliptic-oblong; the leaves sessile or almost so ..... 9. *L. lanceolata*
         8. Lateral leaflets usually ± very broadly obtrullate or obreniform, rarely narrow-elliptic; leaves distinctly petiolate ..... 10. *L. obtrullata*
      7. Central leaflet of each leaf up to 2.5 cm long including the pungent tip, longer than the lateral leaflets but not disproportionately so ..... 6. *L. deserticola*
5. Leaves digitately (3)5-9-foliolate, occasional 3-foliolate leaves accompanied by leaves with 5-9 leaflets:
   9. Sepals 4:
      10. Upper leaflet surface usually glabrous, lower surface glabrous or with scattered appressed or erect uncinate hairs ..... 9. *L. lanceolata*
      10. Upper leaflet surface with numerous erect uncinate hairs, lower surface densely clothed with appressed white hairs up to 2 mm long, especially on the midrib ..... 7. *L. saxicola*
   9. Sepals 5:
      11. Leaflets compressed and ± subterete or linear- to narrow elliptic-oblong, up to 2 mm wide, the margins tightly recurved to conceal the lower surface except for the midrib or portion of the midrib or sometimes portion of the lower surface visible also ..... 4. *L. teretifolia*
      11. Leaflets not as above:
         12. Leaflets rigid, folded lengthwise and deeply channelled above or U-shaped in section, sometimes almost conduplicate, 1-3.5 mm wide ..... 5. *L. eremaea*
         12. Leaflets not as above:
            13. Upper leaflet surface sparingly to densely clothed with uncinate hairs; central leaflet of each leaf usually distinctly obovate-oblong ..... 8. *L. nitida*
            13. Upper leaflet surface usually glabrous; central leaflet of each leaf elliptic- or narrow-oblong ..... 9. *L. lanceolata*
1. Anthers more or less the same size:
   14. Leaves unifoliolate ..... 14. *L. punctata*
   14. Leaves digitately or subdigitately 3-7-foliolate:
      15. Leaves 3-5-foliolate, the central leaflet of each leaf disproportionately longer than the others, 2.5-9 cm long including the pungent tip ..... 11. *L. rupestris*
      15. Leaves 5(7)-foliolate, the central leaflet of each leaf not disproportionately longer than the others, up to 3 cm long including the pungent tip:
         16. Sepals 4; young branchlets usually densely clothed with spreading hairs up to 0.6 mm long; petioles up to 1.5 mm long; lower leaflet surface usually with scattered appressed hairs especially on the midrib ..... 12. *L. digitata*
         16. Sepals 5; young branchlets clothed with spreading hairs up to 1.5 mm long and scattered shorter erect uncinate hairs; petioles 1-5 mm long; lower leaflet surface glabrous except for scattered hairs up to 1.75 mm long on the midrib and sometimes on the margins ..... 13. *L. stellata*

1. **Labichea cassioides** Gaudich. ex DC., Prodr. 2:507 (1825); Gaudich. in Freycinet, Voy. Uranie 485, t. 112 (1830); Benth., Fl. Austral. 2:292 (1864). TYPE: Western Australia, "baie des chiens marins" (Shark Bay), *C. Gaudichaud s.n.* (P, here selected as lecto.; K, ? isolecto.).

L. tephrosiifolia Meissner, Bot. Zeitung 13:12 (1855). TYPE: Western Australia, between Moore and Murchison Rivers, *Drummond* Coll. VI, No. 7 (BM, NY, W, iso.).

Subshrub or shrub to 2 m high, often wider than high, occasionally semi-scandent, young branchlets glabrous or sparingly clothed with appressed and scattered erect uncinate hairs. *Leaves* imparipinnate, 3-17-foliolate, the lowest pair of leaflets inserted on the rhachis at or near its attachment to the branch, the terminal leaflet largest; rhachis 0.15-2(4.8) cm long, glabrous or sparingly clothed with uncinate and/or appressed hairs; leaflets narrow-oblong to obovate- or elliptic-oblong, 1-3.5 cm long including the pungent apex, 0.15-1 cm wide, petiolulate, upper surface with short tubercular-based uncinate hairs especially when young, the raised bases persisting, lower surface glabrous or with scattered appressed hairs especially on the midrib. *Stipules* narrow-ovate, 1.5-2.5 x 1-1.25 mm, pubescent, soon deciduous. *Racemes* 2-10-flowered, often as long as or longer than the leaves, subglabrous to sparingly clothed with appressed and scattered uncinate hairs; bracts ovate, 2-2.5 x 1.25-1.75 mm, sparingly appressed-pubescent. *Pedicels* 4-8 mm long, sparingly clothed with appressed and scattered uncinate hairs. *Sepals* 5, the 2 outer 9.5-11 x 3.5-4.7 mm, sparingly clothed with appressed and scattered uncinate hairs, the 3 inner 8.5-10.5 x 2.5-4.5 mm. *Petals* 4, 8.5-12 x 8-13 mm. *Stamens* unequal, one anther much longer than the other; filaments up to 0.5 mm long; short anther 4.5-6 mm long, long anther 8-9 mm long. *Ovary* up to 3.5 mm long, 2-ovulate, villous. *Pods* obliquely oblong-elliptic, 2.2-3 x 0.9-1 cm,

narrowed to an acute beak apically, clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seeds* (immature) elliptic-oblong, ± 6.5 x 4 mm.

Occurs on the northern sandplain and the north-west coast of Western Australia from Cervantes in the south to the Ashburton River in the north (Fig. 2). A discontinuity apparently separates the populations in the south from those in the north. Found on sand, limestone or loam and often in association with *Acacia, Triodia* or *Spinifex* spp.

Fig. 2. The known distributions of *Labichea cassioides, L. brassii* and *L. buettneriana*.

REPRESENTATIVE SPECIMENS (total number examined, 24):

Western Australia — Cockleshell Gully, ii.1940, *C. A. Gardner s.n.* (PERTH). 5 km S. of Kalbarri National Park boundary on coast road to Gregory, 27.ix.1982., *M. G. Corrick 8267* (MEL 621523). NE. of Tamala Station H.S., 26.viii.1969, *A. S. George 9564* (PERTH). Between Monkey Mia and Denham, 9.x.1973, *J. S. Beard 6777* (PERTH). 32 km S. of Learmonth, 5.viii.1967, *A. S. George 9173* (PERTH). Nanutarra, Ashburton River, 4.x.1905, *A. Morrison* (PERTH).

NOTES:

The plate (t. 112) accompanying Gaudichaud's description, in Freycinet, Voy. Uranie 485 (1830), illustrates a flowering specimen with young pods and a detached pod and seeds indicating that Gaudichaud had before him flowering and fruiting material. Through the courtesy of the Director, Muséum National d'Histoire Naturelle, Paris, I have examined type material of *L. cassioides* which consisted of a flowering specimen. The whereabouts of the fruiting material illustrated in t. 112 is unknown. The seeds illustrated lack a swollen funicle. I have not seen mature seed of *L. cassioides* but a swollen funicle was present in immature seed examined, suggesting that either the artist was in error or that the detached pod and seeds illustrated were not those of *L. cassioides*. In order to obviate any uncertainty, the flowering specimen in P collected by Gaudichaud at "baie des chiens marins" is here selected as the lectotype of *L. cassioides*. A small fragment in K is possibly an isolectotype.

L. cassioides is a polymorphic species within which a considerable range of variation in leaflet number and size is encountered. The extremes, for example *Keighery 4593* (KINGS PARK) from near Cervantes with numerous pairs of narrow leaflets and *George 9564* from Tamala Station with few broad leaflets, look quite different but they are linked by inter-

mediates so that when the entire range of variation is inspected it is difficult to divide it satisfactorily. There is an inconsistent tendency for leaflet number to be correlated with leaflet width and, to a lesser extent, with shape and geographical distribution. Specimens with numerous (mostly 7-17) narrow (mostly up to 2.75 mm wide) leaflets tend to occupy the southern part of the distributional range of the species (vicinity of Cervantes to Cockleshell Gully) and specimens with fewer (3-7) leaflets more than 2.75 mm wide occur from the vicinity of Port Gregory northwards. No specimens with few large leaflets have been recorded south of Port Gregory.

Flower size also varies but less so than the leaflets. Specimens in the north with few large leaflets tend to have larger flowers but there is no discontinuity in flower size between the northern and southern populations.

The name *L. tephrosiifolia* Meissner applies to the southern populations. Meissner based his description on Drummond Coll. VI, No. 7, collected between the Moore and Murchison Rivers. Drummond specimens in BM and W labelled "6th coll. No. 7" and "Ser. 6 No. 7" respectively represent type material, and the fragment in NY is labelled as having been taken from Herb. Shuttleworth (BM). Drummond collections in K and MEL labelled "No. 7" and in LD labelled "3rd coll. No. 7" are a good match of the Drummond collections in BM and W and it is probable that the K and MEL sheets, at least, also represent type material.

Detailed field studies will indicate whether there is a satisfactory means of dividing the range of variation and whether or not formal recognition of infraspecific taxa within *L. cassioides* is desirable.

The imparipinnate leaves distinguish *L. cassioides* from the other Western Australian species.

2. **Labichea brassii** C. T. White & Francis, Proc. Roy. Soc. Queensland 41:140, t. IX (1929). TYPE: Queensland, Forest Home Station, Gilbert River, vii.1928, *L. Brass s.n.* (BRI 7968, here selected as lecto.; K, fragm.; CANB 24128 ? isolecto.)

L. nitida Benth. var. *pinnata* F. Muell., Fragm. x:7 (1876). TYPE: Queensland, Gilbert River, *R. Daintree* (MEL 647675, here selected as lecto.).

Shrub up to 3 m high; young branchlets densely clothed with short erect or uncinate hairs and scattered longer hairs up to 2 mm long. *Leaves* imparipinnate, (3)5-7 (9)-foliolate, the leaflets usually progressively larger from the base of the rhachis upwards, the terminal leaflet disproportionately larger than the others, the lowest pair inserted on the rhachis at or near its attachment to the branch and often asymmetric basally; rhachis 0.5-1.5 cm long, clothed like the young branchlets; leaflets elliptic, elliptic-oblong or ovate, margins revolute and sometimes slightly undulate, upper surface with numerous short erect bulbous-based uncinate hairs and scattered longer hairs, the raised bases persisting after the hairs have been shed, lower surface densely clothed with short and long erect, appressed or spreading hairs up to 2 mm long, petiolules densely clothed like the young branchlets; lateral leaflets 0.8-2.5 cm long including a pungent tip up to 3 mm long, 0.275-1.1 cm wide; terminal leaflet 1.8-4.6 cm long including a pungent tip up to 3 mm long, 0.5-1.7 cm wide. *Stipules* ovate, up to 3.5 x 1.5 mm, clothed with short and long appressed hairs, deciduous. *Racemes* (2)6-10-flowered, densely clothed with short and long spreading white hairs up to 2 mm long; bracts ovate, up to 3.5 x 1 mm, deciduous. *Pedicels* 4-10 mm long, densely clothed with short erect or uncinate hairs and scattered longer hairs. *Sepals* 5, the 2 outer 8-10 x 2.5-4 mm, acute apically, densely clothed with short erect and longer mainly spreading hairs up to 2 mm long, inner 3 sepals 5.8-9 x 2-3.6 mm. *Petals* 4, 8-12 x 3.8-8.5 mm. *Stamens* unequal, one anther very much longer than the other, filaments 0.5-0.9 mm long; short anther 3.5-4 mm long, long anther 6.5-7.5 mm long. *Ovary* 3-4 mm long, 2-ovulate, densely villous. *Pod* obliquely elliptic-oblong, narrowed to an acute beak, 2.2-2.6 x 1.0-1.1 cm, clothed with short erect uncinate hairs and longer scattered appressed or spreading hairs. *Seeds* 4-5 x 3.5-4.5 mm.

Known from two collections from the Gilbert River in northern Queensland, one collected prior to 1876 and the other in 1928, and three from Mt Mulligan (Fig. 2). Recorded growing along creek and river beds.

SPECIMENS EXAMINED (total number, 5):

Queensland — Mt Mulligan, 27.ii.1934, *Flecker s.n.* (BRI 285057). Mt Mulligan, 0.5 km S. of mine site along pipeline leading to the falls on Richards Creek, 11.iv.1984, *J. R. Clarkson 5255* (MEL 665928). Mt Mulligan, southern plateau, 12.iv.1984, *J. R. Clarkson 5302* (MEL 665927).

NOTES:

A discontinuity separates the Mt Mulligan and Gilbert River populations. The Mt Mulligan specimens differ slightly from typical *L. brassii* in leaflet shape and size. The leaflets in the former are consistently narrow-elliptic, usually lack undulate margins, and are slightly smaller, the lateral leaflets being 0.275-0.7 cm wide (0.4-1.1 cm wide in typical *L. brassii*) and the terminal leaflets 1.8-4 x 0.5-0.9 cm as opposed to 3.5-4.6 x 1.1-1.7 cm. In addition, the pubescence of the young branchlets is slightly denser and the lower leaflet surfaces are more densely pubescent than in typical *L. brassii.*

L. brassii is a little known species whose affinities are not clear but it does not appear to be closely allied to *L. buettneriana,* the only other Queensland species with imparipinnate leaves.

3. **Labichea buettneriana** F. Muell., Chem. & Druggist Australas. Suppl. 5: 12 (June 1882); Fragm. 12:18 (Dec. 1882). TYPE: Queensland, Endeavour River, 1882, *Persieh 395* (MEL 647677, here selected as lecto.).

Shrub to 1.7 m high, young branchlets densely clothed with appressed to spreading hairs (not uncinate) up to 0.5 mm long. *Leaves* imparipinnate, (3)5-11(13)-foliolate, the leaflets usually progressively larger from the base of the rhachis upwards and the terminal leaflet largest, the lowest pair inserted on the rhachis at or just above its attachment to the branch; rhachis (0.5)1.5-9 cm long, clothed like the young branchlets; leaflets opposite or sub-opposite, oval, elliptic, elliptic-oblong or oblong (rarely obovate-oblong), 0.8-4.3 cm long, 0.5-2.2 cm wide, the apex obtuse or rounded and emarginate or slightly apiculate, margins sometimes slightly undulate, discolorous, upper surface with short erect uncinate hairs and scattered longer appressed or slightly spreading hairs; lower surface densely clothed with appressed or slightly spreading hairs; petiolules 1.5-3.5 mm long, clothed like the young branchlets. *Stipules* narrow-ovate, 2-3.5 x 1-1.5 mm, pubescent, deciduous. *Racemes* 9-22-flowered, up to 10 cm long and longer than the leaves, densely clothed with short and long appressed or slightly spreading hairs; bracts ovate, 4.0-6.5 x 3-3.5 mm, brown, conspicuous, densely pubescent outside except towards the margins, deciduous. *Pedicels* 3-7 mm long, densely pubescent like the raceme. *Sepals* 4 or 5, the 2 outer 11-14 x 4.5-7 mm, the outermost ± cucullate, densely clothed with appressed to slightly ascending hairs, inner 2 or 3 sepals 10-13.5 x 3.2-6.2 mm. *Petals* 4, 10-16 x 7-11.5 mm. *Stamens* unequal, one anther very much longer than the other, filaments 0.6-1 mm long; short anther 4.5-5.3 mm long, long anther 9-10.5 mm long. *Ovary* 3-4 mm long, 2-ovulate, densely villous. *Pods* obliquely elliptic-oblong, 2.8-3.8 x 1.49-1.7 cm, narrowed to an acute apical beak, densely clothed with short erect (not uncinate) and scattered longer hairs. Seeds 6.5-7.5 x 5-5.5 mm.

Confined to north-eastern Queensland from just north of Cooktown to Cape Flattery (Fig. 2). Occurs in low lying sandy areas often among the coastal sand dunes.

REPRESENTATIVE SPECIMENS (total number examined, 8):

Queensland — Cape Flattery, 20.vi.1975, *P. Sharpe 1529* (BRI 198332). Between McIvor River and Cape Flattery, 22.xi.1972, *A. Dockrill 623* (QRS 31337). Near Cape Bedford, 14.vi.1968, *L. Pedley 2625* (BRI 111894). S. of Cape Bedford, 30.vii.1980, *J. R. Clarkson 3301* (BRI 268787, QRS 61968).

NOTES:

L. buettneriana is distinguished by its imparipinnate leaves, leaflets with obtuse or rounded apices which are emarginate or only slightly apiculate, long racemes which exceed the leaves, and broad pods. The obtuse, emarginate or only slightly apiculate leaflet apices are in contrast to the distinctly pungent apices found in other species, and the pods differ from those of other species examined in that the short erect hairs are not uncinate. In *L. buettneriana* uncinate hairs are found only on the upper surfaces of the leaflets.

The seeds are reported (Dockrill 623) to be edible either raw or cooked.

The identity of *L. S. Smith 11145* (BRI 142759), a sterile specimen from the Hoop Pine area near McIvor, is not clear but it possibly represents a local expression of *L. buettneriana*. It differs from other material of *L. buettneriana* examined in having larger leaves and larger (3.5-7 cm long) oblong-elliptic leaflets. More material of this variant, especially fertile material, is desired.

4. **Labichea teretifolia** C. Gardner, J. & Proc. Roy. Soc. Western Australia 27: 175 (1942). TYPE: Western Australia, 48 km (30 miles) N. of Murchison River, 29.viii.1931, *C. A. Gardner 2575* (PERTH, holo.).

Shrub to 1.5 m high, often wider than high, young branchlets densely clothed with appressed to spreading or crinkly hairs (not uncinate). *Leaves* digitately 5-7(-9)-foliolate, the leaflets of each leaf approximately the same size; leaflets sessile, rigid, either compressed, ± subterete and 0.6-1.1 mm wide, or linear- to narrow elliptic-oblong and 0.8-2 mm wide, the margins tightly recurved to conceal all but the midrib or part of the midrib below or portion of the lower surface visible, 0.8-2.2 cm long including the pungent tip, upper surface either with appressed or slightly spreading hairs and uncinate hairs, uncinate hairs only, or scabrid once the hairs have been shed, midrib and lower surface (when visible) usually sparingly to densely clothed with appressed or slightly spreading hairs. *Stipules* broadly ovate, 1.5-5.5 x 1.5-4.5 mm, scarious, usually densely appressed-pubescent except sometimes towards the margins, soon deciduous or persisting for some time. *Racemes* 3-7-flowered, densely clothed with appressed to spreading golden-brown or silvery-white hairs, each flower with an outer broadly ovate scarious bract 1.5-7.5 x 1.5-5 mm and two inner narrowly ovate or elliptic-oblong bracts 1.5-6 x 1-1.5 mm, the bracts pubescent outside except towards the margins. *Pedicels* 2-5 mm long, densely clothed with appressed to spreading golden-brown or silvery-white hairs. *Sepals* 5 (rarely 4 by the lateral fusion of 2 or 6), the 2 outer 5.8-11 x 2-4 mm, with scattered erect uncinate hairs and longer appressed or spreading golden-brown or silvery-white hairs, inner 3 sepals 4.3-9 x 1.3-3.5 mm. *Petals* 4 (rarely 5), (3.5)4.5-10 x 2.6-9.6 mm. *Stamens* unequal, one anther much longer than the other, filaments 0.5-1 mm long; short anther 3.1-5.2 mm long, long anther 4.3-7 mm long. *Ovary* 2.5-3.5 mm long, 2-ovulate, densely villous. *Pods* obliquely elliptic-oblong, elliptic or sometimes the apex somewhat falcate, 1.4-2.7 x 0.5-0.8 cm, clothed with short erect uncinate and scattered longer appressed hairs. *Seeds* 4.4-4.6 x 3.5-3.8 mm.

L. teretifolia has a restricted distribution within the northern portion of Irwin Botanical District of the South West Botanical Province of Western Australia as defined by Beard (1980) occurring from the vicinity of Wannoo southwards to near Geraldton and inland to Mullewa (Fig. 3).

L. teretifolia is a variable species, the variation falling into two groups. The extremes of each group look quite different suggesting that they are referrable to separate species but an examination of the range of variation indicates that this is not the case. The two groups may be differentiated on stipule size and, to a lesser extent, on the colour and nature of the indumentum on the 2 outer sepals. These differences, coupled with other differential tendencies and somewhat different distributional ranges and ecological preferences, suggest that formal recognition of the groups is desirable and they are accorded subspecific status.

KEY TO SUBSPECIES

Stipules 1.5-2.5 mm long, 1.5-2 mm wide; indumentum on 2 outer sepals mostly golden-brown, the non-uncinate hairs usually ± appressed ..... subsp. *teretifolia*

Stipules 3-5.5 mm long, 2-4.5 mm wide; indumentum on 2 outer sepals silvery-white, the hairs usually spreading somewhat ..... subsp. *grandistipulata*

L. teretifolia subsp. **teretifolia**

Stipules 1.5-2.5 mm long, 1.5-2 mm wide; indumentum on the 2 outer sepals mostly golden-brown and the non-uncinate hairs ± appressed.

Occurs in the northern sandplain from about 20 km south of Wannoo southwards to

Fig. 3. The known distributions of *Labichea deserticola*, *L. eremaea*, *L. nitida*, *L. saxicola* and *L. teretifolia*.

the Murchison River; there is a solitary record (Blackall 4812) from south of the Murchison near Yuna. Grows in sandy soil in patches of tall scrub and thickets.

REPRESENTATIVE SPECIMENS (total number examined, 10):

Western Australia — 25.6 km S. of Wannoo Roadhouse, viii.1967, *C. H. Gittens 1548* (BRI 86452, NSW 85182, PERTH). Proposed Toolonga Nature Reserve, 22.ix.1972, *A. Burbidge 65* (PERTH). 67 km N. of Murchison River on North West Coastal Highway, 30.viii.1982, *J. H. Ross 2706* (MEL 104558, PERTH). 42 km N. of Murchison River on North West Coastal Highway, 30.viii.1982, *J. H. Ross 2710* (MEL 104559, PERTH). Between Yuna and Dartmoor, 20.ix.1940, *W. E. Blackall 4812* (PERTH).

NOTES:

Subsp. *teretifolia* is a relatively uniform taxon. In addition to differences in stipule size and sepal pubescence, other inconsistent differential tendencies distinguish the two subspecies. In subsp. *teretifolia* the leaves tend to be more congested on the branches (in subsp. *grandistipulata* the internodes are often much longer which gives specimens a somewhat different facies), the leaflets are always compressed and ± subterete (similar leaflets occur in subsp. *grandistipulata* but in addition a much wider range of variation in width and shape is present), and the flowers tend to be smaller although there is continuous variation in flower size from one subspecies to the other. Sepal length and width in subsp. *teretifolia* are 4.3-7.5(9.6) x 1.6-3 mm respectively as opposed to (6.1)7-11 x (1.6)2.5-4.2 mm in subsp. *grandistipulata*, and petal length and width are (3.5)4.5-6.5(8.3) x 2.6-5.5 mm respectively in subsp. *teretifolia* and (5.8)6.2-10 x (2.7)4.4-9.6 mm in subsp. *grandistipulata*.

Some variation in floral structure was observed. In Gittens 1548 some flowers had a fifth petal much reduced in size (± 3.5 x 1.1 mm), whereas in Burbidge 65 flowers were found with three stamens, two short ones of similar length and a longer one. In other flowers of Burbidge 65 the two stamens were accompanied by a sterile staminode, and in one flower dissected a linear appendage was present in addition to the two stamens and staminode.

There is a suggestion that pod size and shape are slightly different in the two subspecies but insufficient specimens with mature pods are available to establish whether the apparent differences are real. The pods in subsp. *grandistipulata* tend to be longer and are often somewhat falcate apically but pod size and shape need further investigation.

For some inexplicable reason Gardner recorded the leaves as digitately 3-foliolate even although some of the leaves on the type collection are clearly 5-foliolate.

L. teretifolia subsp. **grandistipulata** J. H. Ross, subsp. nov.

Subspecies nova a subspecie typica stipulis 3-5.5 mm longis, 2-4.5 mm latis et sepalis 2 exterioribus pilis argenteo-albis plerumque aliquantum patentibus, differt.

TYPE: Western Australia, between Yuna and Mullewa Road, 14.viii.1965, *A. M. Ashby 1581* (AD 96550426 holo., MEL 104565, PERTH, iso.).

Stipules 3-5.5 mm long, 2-4.5 mm wide; indumentum on 2 outer sepals silvery-white and the hairs usually spreading somewhat.

Occurs mainly south of the Murchison River to near Geraldton and inland to Mullewa. The only record from north of the Murchison River is *Ashby 2184* (AD, PERTH) collected "between Murchison sandplain and Billabong". Reported growing in loam, gravel, clay and sand and apparently a coloniser of disturbed sites such as disused gravel pits and road cuttings. It appears to have slightly different ecological preferences to subsp. *teretifolia* and a wider ecological tolerance.

REPRESENTATIVE SPECIMENS (total number examined, 25):

Western Australia — 1.5 km W. of Ajana on road to Kalbarri, 31.viii.1982, *J. H. Ross 2720* (MEL 104561, PERTH). 5 km S. of the turn-off to Kalbarri on the North West Coastal Highway, 31.viii.1982, *J. H. Ross 2723* (MEL 104563). East Yuna Reserve, 17.ix.1967, *A. C. Burns 69* (PERTH). 1.6 km S. of Eradu, 29.ix.1966, *E. M. Scrymgeour 1443* (PERTH). 15.5 km W. of Mullewa on Geraldton-Mullewa Rd., 31.viii.1982, *J. H. Ross 2725* (MEL 104560, PERTH).

NOTES:

Subsp. *grandistipulata* is a more heterogeneous taxon than subsp. *teretifolia,* especially in leaflet size and shape. In typical subsp. *grandistipulata* the leaflets are linear-oblong to narrow elliptic-oblong and often the margins are less tightly recurved than in subsp. *teretifolia* so that more of the midrib or sometimes even portion of the lower leaflet surface is visible. The different leaflet shape, sometimes coupled with slightly longer internodes, tends to give specimens a somewhat different facies. The upper leaflet surfaces are often glabrous or with only uncinate hairs unlike in subsp. *teretifolia* where long appressed hairs are often present in addition to the uncinate hairs.

The large stipules on the young shoots are very distinctive, whence the subspecific epithet.

5. **Labichea eremaea** C. Gardner, J. & Proc. Roy. Soc. Western Australia 27:175 (1942). TYPE: Western Australia, near Anketell, 27.2 km (17 miles) W. of Sandstone, 17.viii.1931, *C. A. Gardner 2505* (PERTH, holo., PERTH, iso.).

Compact rigid *shrub* to 0.8 m high, often wider than high, young branchlets densely clothed with spreading hairs. *Leaves* digitately 5-7-foliolate, sessile, the central leaflet largest; petiolules 0.5-1.25 mm long; leaflets narrow-elliptic or narrow-obovate-oblong, folded lengthwise and deeply channelled above or U-shaped in section, sometimes almost conduplicate, rigid, lower surface sparingly to densely clothed with uncinate and/or straight hairs; central leaflet 1.2-2.8 cm long including the pungent tip up to 0.3 cm long, 0.1-0.35 cm wide; lateral leaflets 0.7-2.1 cm long including the pungent tip, 0.1-0.2 cm wide. *Stipules* narrow-triangular or subulate, 1.5-5 mm long, 0.4-1 mm wide, densely pubescent, persistent. *Flowers* mostly in pairs, shorter than the leaves. *Pedicels* up to 4 mm long, densely clothed with ± spreading hairs; bracts ovate, 2-3.5 x 1.5-2 mm, with spreading hairs, deciduous. *Sepals* 5, the 2 outer 7.8-8.5 x 2.6-3.5 mm, acute apically, densely clothed with spreading hairs, the 3 inner sepals 7-7.5 x 2-3 mm. *Petals* 4, 6-8 x 3.8-7.5 mm. *Stamens* unequal, one anther much longer than the other; filaments 0.5-0.8 mm long; short anther 3.6-3.9 mm long, long anther 5.5-6 mm long. *Ovary* ± 2.5 mm long, 2-ovulate, densely villous; style up to 3.5 mm long. *Pods* (only old twisted dehisced valves seen) obliquely oblong-elliptic, 1.4-1.8 x 0.8-1 cm, narrowed to an acute beak apically, densely clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seed* (only 1 seen) 4 x 3.5 mm, the testa marked with longitudinal rows of glandular dots.

L. eremaea has a restricted distribution in Western Australia between Anketell and Sandstone where it occurs in red sand with mallee *Eucalyptus* spp. and other Myrtaceous, Proteaceous and Solanaceous shrubs (Fig. 3).

SPECIMENS EXAMINED (total number, 5):
Western Australia — 16 km W. of Sandstone, 15.viii.1931, *C. A. Gardner & W. E. Blackall 474* (PERTH). ± 10 km from Anketell Station eastern boundary along road towards Sandstone, 22.viii.1982, *P. S. Short 1546* (MEL 629302). ± 1 km W. of Anketell Station eastern boundary along Sandstone — Mt Magnet Road, 22.viii.1982, *P. S. Short 1547* (MEL 629304).

NOTES:
Fruiting material is desired as only old pod valves have been collected.

6. **Labichea deserticola** J. H. Ross, sp. nov.
Species nova L. lanceolatae Benth. affinis, a qua foliis semper 3-foliolatis cum foliolis anguste ovatis vel ellipticis minoribus differt.

TYPE: Western Australia, Victoria Desert Camp 44, 27°44′ S, 126°33′ E, 7.ix.1891, *R. Helms s.n.* (AD 98223004, holo.; MEL 616545, NSW 150255-150257, iso.).

Shrub to 1 m high, young branchlets clothed with appressed or slightly spreading hairs. *Leaves* digitately 3-foliolate, the central leaflet largest: petiole up to 1.25 mm long, pubescent; leaflets narrow-ovate or elliptic, sessile, conspicuously reticulate, upper surface with scattered tubercular-based uncinate hairs, lower surface sparingly appressed-pubescent; central leaflet 1.6-2.3 cm long including the pungent tip up to 0.4 cm long, 0.4-0.6 cm wide; lateral leaflets 0.9-1.6 cm long including the pungent tip, 0.325-0.5 cm wide. *Stipules* narrow-triangular, up to 1.75 x 1.0 mm, ± appressed-pubescent, soon deciduous. *Racemes* mostly 3-5-flowered and longer than the leaves; bracts ovate, up to 3 x 2 mm, pubescent, deciduous. *Pedicels* 4-6 mm long, densely ± appressed-pubescent. *Sepals* 4, sparingly to densely appressed-pubescent, the 2 outer 10.5-11 x 3.4-3.8 mm, acute apically, the 2 inner sepals 8.5-10.6 x 2.8-3.5 mm. *Petals* 4, 8-10 x 3-5.2 mm. *Stamens* unequal, one anther nearly twice as long as the other, filaments up to 0.5 mm long; short anther ± 5 mm long, long anther 8.5-9 mm long. *Ovary* up to 4 mm long, 2-ovulate, villous. *Pod* (only 1 immature pod seen) elliptic-oblong, 1.8 x 0.8 cm, with short erect uncinate hairs and longer appressed hairs. *Seeds* unknown (Fig. 4).

Known only from the type collection from the Victoria Desert, Western Australia (Fig. 3). Ecological preferences and conservation status unknown.

NOTES:
Differs from *L. lanceolata* in having consistently 3-foliolate leaves, the central leaflet being only slightly larger than the two lateral ones and not markedly disproportionate, and in the leaflets being differently shaped and conspicuously reticulately veined.
More material, especially fruiting material, is desired.

7. **Labichea saxicola** J. H. Ross, sp. nov.
Species nova L. nitidae Benth. affinis, a qua pilis conspicuis adpressis ad 2 mm longis in foliolis paginae inferioris; pilis ad 2 mm longis in ramulis juvenilibus, petiolis, racemis, pedicellis, bracteis et sepalis; et floribus cum 4 sepalibus, differt.

TYPE: Northern Territory, Kakadu National Park, 1 km S. of Twin Falls, 23.v.1980, *L. A. Craven 5797* (CANB 309315, holo.; DNA 19919, MEL 616040, iso.).

Shrub to 2 m high, young branchlets densely clothed with a mixture of short erect or appressed hairs (not uncinate) and scattered appressed or spreading villous hairs up to 2 mm long. *Leaves* digitately (3)5(7)-foliolate, the central leaflet largest; leaflets elliptic, elliptic-oblong, oblong or obovate-oblong, discolorous, upper surface densely clothed with erect uncinate hairs, margins thickened and slightly revolute, lower surface densely clothed with appressed white hairs up to 2 mm long especially on the midrib (rarely a few uncinate hairs present), petiolules densely clothed with appressed or spreading hairs; central leaflet 1.7-4.3 cm long including a pungent tip up to 3 mm long, 0.6-1.3 cm wide; lateral leaflets 0.8-2.8

Fig. 4. *Labichea deserticola*. a — flowering twig, x 1. b — trifoliolate leaf, x 2. c — flower, x 3. d — stamens and gynoecium, x 6. All from *Helms s.n.* (AD 98223004).

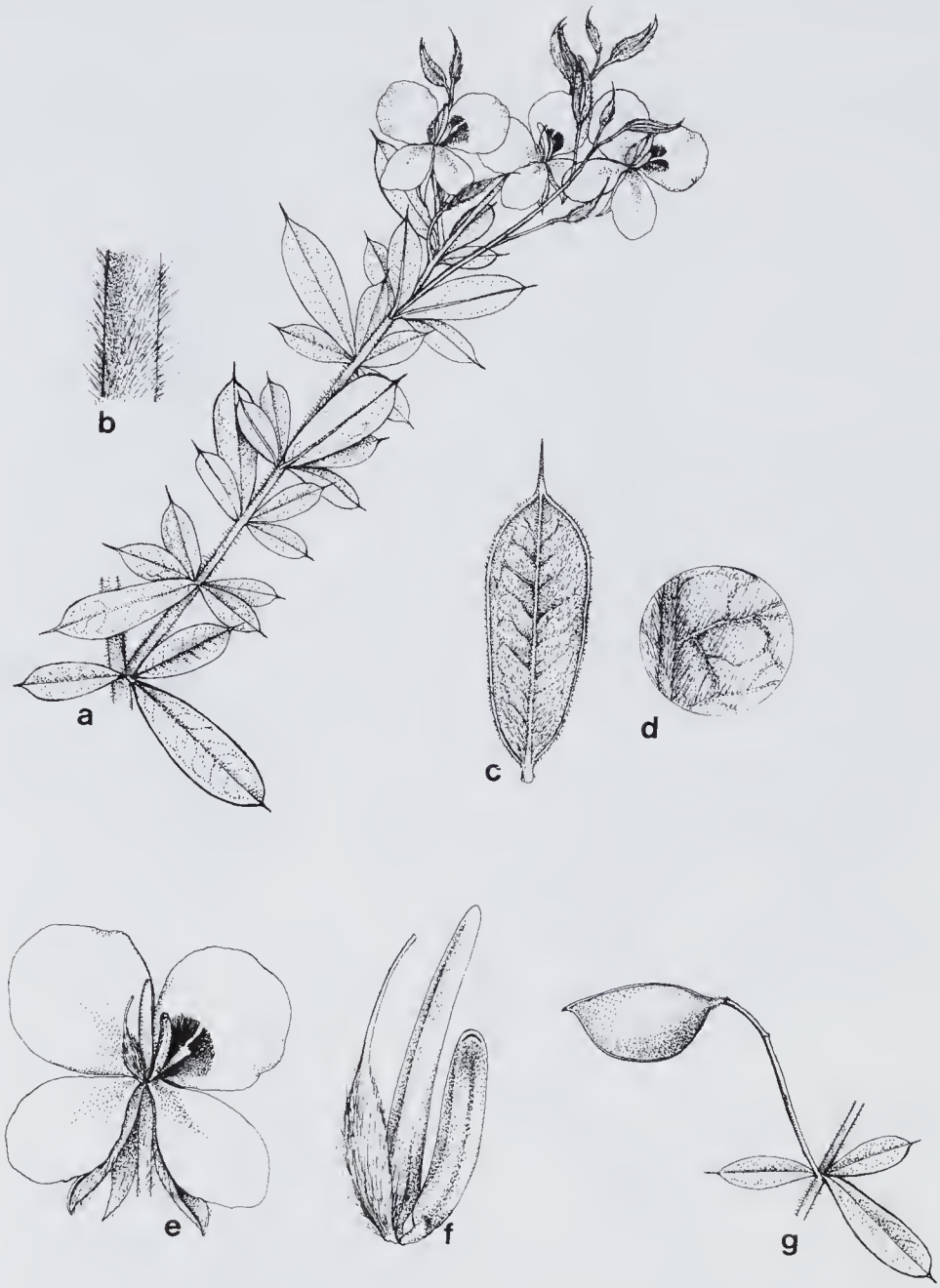

Fig. 5. *Labichea saxicola*. a — flowering twig, x 1. b — portion of young stem showing a mixture of short and longer spreading hairs, x 3. c — leaflet, x 2. d — portion of lower leaflet surface showing appressed hairs, x 6. e — flower, x 2. f — stamens and gynoecium, x 6. g — portion of fruiting twig, x 1. a — f from *L. A. Craven 5797* (CANB 309315); g from *N. Byrnes 1519* (BRI 130175).

cm long including a pungent tip up to 3 mm long, 0.4-0.9 cm wide. *Stipules* triangular, up to 2.5 x 1.5 mm, deciduous. *Racemes* 2-10-flowered, usually longer than the leaves, densely clothed with a mixture of short and long appressed or spreading hairs (none uncinate) up to 1.5 mm long; bracts narrow-ovate, up to 4 mm long, densely clothed with short and long appressed hairs, deciduous. *Pedicels* 4-10 mm long, densely clothed with a mixture of short (not uncinate) and long appressed and spreading hairs up to 1.2 mm long. *Sepals* 4, the 2 outer 9-11.5 x 3.7-4.5 mm, acute apically, densely clothed with a mixture of short erect uncinate hairs and longer appressed or spreading hairs up to 1.5 mm long, inner 2 sepals 6.5-10 x 2.4-4.5 mm. *Petals* 4, 9-12 x 5.6-10 mm. *Stamens* unequal, one anther much longer than the other, filaments 0.5-0.7 mm long; short anther 3.7-5 mm long, long anther 7.5-8.8 mm long. *Ovary* 3-4.5 mm long, 2(3)-ovulate, densely villous. *Pods* obliquely elliptic-oblong, narrowed to an acute beak, 2-2.6 x 0.9-1.1 cm, clothed with short erect uncinate hairs and longer scattered appressed or spreading hairs. *Seeds* 5-5.5 x 3.5-4.5 mm (Fig. 5).

Confined to the Northern Territory north of 14°S and usually associated with sandstone outcrops (Fig. 3).

Representative Specimens (total number examined, 10):

Northern Territory — 3.7 km N. of El Sharana, 25.i.1973, *Martensz & Schodde 558* (BRI 151831, CANB 239847, DNA 6119, NT 38367). 54.4 km SE. of Mudginbarry H.S., 20.ii.1973, *M. Lazarides 7796* (BRI 229937, CANB 265916, NT 52973). 6 km ESE. of Twin Falls, 24.v.1980, *M. Lazarides 8942* (CANB 295339, DNA 19920). Jim Jim Falls, 30.i.1981, *C. R. Dunlop 5685* (DNA 19073, MEL 609386).

Notes:

The flowers in *L. saxicola* typically have 4 sepals although in one flower on the DNA sheet of *Lazarides 8942* 5 sepals were present. The occurrence of 5 sepals is abnormal as the other flowers dissected on the DNA sheet had 4 sepals as did the sheet of *Lazarides 8942* in CANB and all of the flowers examined on the other specimens.

L. saxicola is allied to, and formerly was confused with, *L. nitida*. Apart from the difference in sepal number between *L. saxicola* and *L. nitida* and the tendency for the ovaries in *L. saxicola* to be 2(3)-ovulate and those in *L. nitida* (2)3-4-ovulate, the indumentum in the two species differs in density and in composition. The indumentum is denser on the young branchlets, lower surface of the leaflets, petiolules, racemes, pedicels, bracts and sepals in *L. saxicola* than in *L. nitida* and the appressed pubescence on the lower surface of the leaflets is particularly distinctive. The diagnostic differences between the two species are listed in Table 1. In addition, the species have different distributions and ecological preferences, *L. saxicola* usually being associated with sandstone outcrops.

8. **Labichea nitida** Benth., Fl. Austral. 2:293 (1864). Type: Queensland, Burdekin River estuary, *E. Fitzalan s.n.* (MEL 640529 here selected as lecto.).

Shrub to 2 m high, young branchlets with a mixture of short erect uncinate hairs and longer appressed or spreading hairs up to 0.75 mm long. *Leaves* digitately (3)5(7)-foliolate, the central leaflet largest; leaflets elliptic-oblong, narrow-oblong or obovate-oblong, discolorous, upper surface often shiny, sparingly to densely clothed with uncinate hairs, margins thickened and sometimes slightly revolute, lower surface glabrous throughout, with scattered uncinate hairs on the midrib or throughout or with uncinate and longer appressed hairs on the midrib, petiolules glabrous or with scattered uncinate or short appressed or spreading hairs; central leaflet 1.5-4.4 cm long including a pungent tip up to 4 mm long, 0.2-1.2 cm wide; lateral leaflets 0.6-3.3 cm long including a pungent tip up to 0.3 mm long, 0.2-0.9 cm wide. *Stipules* triangular, up to 2.5 x 1.5 mm, deciduous or a few persisting for some time. *Racemes* 2-7-flowered, shorter or longer than the leaves, with short erect uncinate hairs or a mixture of uncinate and appressed or spreading hairs up to 0.5 mm long; bracts narrow-ovate, up to 3.5 mm long, glabrous or sparsely clothed with erect or uncinate hairs, deciduous. *Pedicels* 3-10 mm long, with short erect uncinate hairs or a mixture of uncinate and longer appressed or spreading hairs up to 0.25 mm long. *Sepals* 5, the 2 outer 8.6-11 x 3.2-4.2 mm, acute apically, usually with short uncinate hairs and appressed or spreading hairs up to 0.5 mm long, occasionally subglabrous, inner 3 sepals 6.8-9.5 x (1.5)2-4 mm.

Table 1. Diagnostic differences between *Labichea nitida* and *L. saxicola*.

	L. nitida	L. saxicola
indumentum of young branchlets	mixture of short erect uncinate hairs and longer appressed or spreading hairs up to 0.75 mm long	mixture of short erect or appressed hairs (not uncinate) and scattered appressed or spreading villous hairs up to 2 mm long
indumentum of leaflets	upper surface sparingly to densely clothed with uncinate hairs; lower surface glabrous throughout, with scattered uncinate hairs on midrib or throughout, or with uncinate and appressed long and short hairs on the midrib	upper surface densely clothed with erect uncinate hairs; lower surface densely clothed with appressed white hairs up to 2 mm long especially on the midrib (rarely a few uncinate hairs present)
indumentum of petiolules	glabrous or with scattered uncinate or short appressed or spreading hairs	densely clothed with appressed or spreading hairs up to 1.2 mm long
indumentum of racemes	short erect uncinate hairs or a mixture of uncinate and appressed or spreading hairs up to 0.25 mm long	mixture of short and long appressed or spreading hairs (not uncinate) up to 1.5 mm long
indumentum of pedicels	short erect uncinate hairs or a mixture of uncinate and longer appressed or spreading hairs up to 0.25 mm long	mixture of short and long appressed and spreading hairs (not uncinate) up to 1.2 mm long
indumentum of bracts	glabrous or sparsely clothed with erect or uncinate hairs	densely clothed with short and long appressed hairs
number of sepals	5	4
indumentum of sepals	short uncinate hairs and appressed or spreading hairs up to 0.5 mm long or occasionally subglabrous	mixture of short erect uncinate hairs and longer appressed or spreading hairs up to 1.5 mm long
number of ovules	(rarely 2) 3 — 4	2 (rarely 3)

Petals 4(5), 7.6-13 x 5-11 mm. *Stamens* unequal, one anther much longer than the other, filaments 0.5-1 mm long; short anther 4.3-5.5 mm long, long anther 6.8-7.2 mm long. *Ovary* 3.5-4.5 mm long, (2)3-4-ovulate, densely villous. *Pods* obliquely elliptic-oblong, narrowed to an acute beak, 2-3 x 0.9-1.5 cm, clothed with short erect uncinate hairs and longer scattered appressed or spreading hairs. *Seeds* 4.5-6 x 3.3-4 mm, the testa marked with longitudinal rows of glandular dots.

Confined to the coastal area of north-eastern Queensland from the vicinity of Bowen northwards and common on Hinchinbrook Island (Fig. 3). Recorded from coastal dunes, dry scrub, open woodland, exposed rocky outcrops and gravel beds in riparian vegetation subject to periodic flooding.

Representative Specimens (total number examined, 17):

Queensland — Cook Distr., Cape York Peninsula, Brown's Creek, Pascoe River, 14.vii.1948, *L. J. Brass 19566* (BRI 2228, CANB 186232). North Kennedy Distr., 2 km S. of Station Creek, Cape Upstart, 9.iv.1975, *T. J. McDonald & G. N. Batianoff 1421* (BRI 206043). Walsh River-Channel rd., 31.v.1971, *B. P. M. Hyland 5053* (BRI 159461). Hinchinbrook Island, Little Ramsay Bay, 11.viii.1975, *P. Sharp 1598* (BRI 196611).

Notes:

Bentham based his description of *L. nitida* on two specimens, one labelled as having been collected by Bynoe from Victoria River, Northern Territory, and the other collected on the Burdekin Expedition in Queensland. The former syntype is housed in K and the latter in MEL and the specimens agree in all essential respects. Apart from the Bynoe specimen allegedly from the Victoria River, Northern Territory, *L. nitida* is known only from the coastal areas of north-eastern Queensland. As the alleged Northern Territory occurrence is separated so widely from the Queensland populations, and as the Bynoe specimen matches other material from the Queensland populations so closely, it seems questionable whether the Bynoe specimen was in fact collected in the Northern Territory and raises the possibility that the label does not belong with the specimen. To obviate any

confusion, the specimen housed in MEL (MEL 640529) collected by E. Fitzalan on the Burdekin Expedition is selected here as the lectotype.

Bentham described the flowers as having 5 petals but all of the flowers that I have dissected had 4 petals.

L. nitida is allied to *L. saxicola* and the differences between the two are discussed under the latter. *L. rupestris* differs in having the stamens more or less equal in length.

9. **Labichea lanceolata** Benth. in Huegel Enum. 41 (1837); Benth., Fl. Austral. 2:293 (1864). PROBABLE SYNTYPES: Western Australia, King George Sound, *Huegel s.n.* (W!); Swan River, *Huegel s.n.* (W!).

Shrub to 4 m high, sometimes wider than high, young branchlets glabrous or with short erect uncinate, appressed or spreading hairs, often flattened apically. *Leaves* unifoliolate or digitately 3-6-foliolate and then the central leaflet largest and the leaves sessile or almost so; leaflets coriaceous, upper surface usually glabrous, margins thickened, often slightly revolute and with tubercular-based uncinate hairs, lower surface glabrous or with scattered appressed hairs or erect uncinate hairs; central or solitary leaflet narrow-oblong to elliptic-oblong (rarely obovate-oblong), 1.1-12 cm long including a pungent tip up to 0.3 cm long, 0.2-2(2.5) cm wide, on a petiolule up to 0.7 cm long; lateral leaflets elliptic or elliptic-oblong, 0.6-1.7 cm long including a pungent tip up to 0.25 cm long, 0.175-0.5 cm wide, subsessile or shortly petiolulate. *Stipules* broadly triangular, up to 2.5 x 1.5 mm, deciduous. *Racemes* 2-12-flowered, shorter or longer than the leaves, usually glabrous or with appressed hairs, erect uncinate hairs or a mixture of both; bracts ovate, up to 2 x 1.5 mm, deciduous. *Pedicels* 5-9.5 mm long, usually glabrous or with appressed hairs, erect uncinate hairs or a mixture of both. *Sepals* 4 (rarely 5), the 2 outer 8.8-12 x 3-5 mm, acute apically, usually with short uncinate or appressed hairs, the latter often dark purplish or black, inner 2(3) sepals 5-10.2 x 2-4.5 mm. *Petals* 4, 9-16 x 7-15 mm. *Stamens* unequal, one anther much longer than the other, filaments 0.5-1 mm long; short anther 4.5-5.5 mm long, long anther 7.5-9.5 mm long. *Ovary* 4-5 mm long, 2-ovulate, densely villous, the hairs white, ferruginous or black. *Pods* obliquely elliptic-oblong, narrowed to an acute beak, 2.5-4 x 0.8-1.1 cm, clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seeds* 5-6.5 x 3.7-4.5 mm, the testa marked with longitudinal rows of glandular dots (Fig. 6).

L. lanceolata is the most widely distributed species in the genus occurring in Western Australia from near the mouth of the Murchison River in the north southwards and south-eastwards to Israelite Bay (Fig. 7).

The variation within this species falls into two groups, one consisting of plants with unifoliolate or 3-foliolate leaves and the other of plants with 4-6-foliolate leaves. The two groups tend to have different distributional ranges and are accorded subspecific status.

KEY TO SUBSPECIES

Leaves unifoliolate or 3-foliolate, the central or solitary leaflet (2.3)4-12 cm long, (0.4)0.8-1.5(2) cm wide..... subsp. *lanceolata*

Leaves (3)4-6-foliolate, the central leaflet 1.1-6 cm long, 0.2-1 cm wide ..... subsp. *brevifolia*

L. lanceolata subsp. **lanceolata**

L. lanceolata Benth. in Huegel Enum. 41 (1837); Benth., Fl. Austral. 2:293 (1864) pro parte. SYNTYPES as above.

L. bipunctata Paxton, Mag. Bot. 10:149-50 (1843). TYPE: Paxton, l.c. (iconotype).

L. diversifolia Meissner var. *longifolia* Meissner in Lehm., Pl. Preiss. 1:23 (1844). TYPE: Western Australia, near Swan River, *Drummond* coll. 1 in Herb. Shuttleworth (BM, here selected as lecto.).

Leaves unifoliolate or 3-foliolate; the central or solitary leaflet (2.3)4-12 cm long, (0.4)0.8-1.5(2) cm wide; lateral leaflets 0.8-1.7 cm long, 0.3-0.5 cm wide.

Occurs in the northern sandplain and heath from the Murchison River southwards to the Jarrah forest of the Darling Range and Canning River south-east of Perth. Recorded

Fig. 6. *Labichea lanceolata* subsp. *lanceolata*. a — flowering twig, x 1. b — trifoliolate leaf, x 1. c — pod, x 1. d — seed, x 3. *L. lanceolata* subsp. *brevifolia*. e — flowering twig, x 1. a from *M. G. Corrick 8088* (MEL 614947); b from *M. G. Corrick 8216* (MEL 614919); c & d from *F. Mueller s.n.* (MEL 626642); e from *M. G. Corrick 7668* (MEL 605109).

from a variety of habitats including sandy soils or silt along creeks or rivers, rocky creek banks, granite outcrops, stony hillsides, lateritic or granitic soils.

REPRESENTATIVE SPECIMENS (total number examined, 76):
Western Australia — Kalbarri National Park, above Murchison River at Z Bend, 24.ix.1982, *M. G. Corrick 8216* (MEL 614949). Arrowsmith River, near Drummond's Crossing, N of Eneabba, 20.ix.1982, *M. G. Corrick 8088* (MEL 614947). 18 km W. of Northampton on Port Gregory Road, 21.viii.1982, *C. E. Woolcock s.n.* (MEL 627872). Dongara, x.1898, *R. Helms s.n.* (PERTH). Sources of the Swan River, 1889, *J. Sewell s.n.* (MEL 626646). Kelmscott, Canning River, 10.ix.1898, *R. Helms s.n.* (PERTH).

NOTES:
Bentham based his description of *L. lanceolata* on Huegel specimens allegedly collected from "King Georges Sound et Swan-River." I have not succeeded in locating type material labelled as having been collected by Huegel but two specimens in W labelled King Georges Sound and Swan River respectively, without any indication of the collector or date of collection, are probably syntypes. The specimens agree well with Bentham's comprehensive description of *L. lanceolata* which leaves no doubt about the correct application of this name. Typical *L. lanceolata* has not been recorded within several hundred kilometres of King George Sound so it appears likely that the Huegel specimen cited by Bentham was collected further north and not at King George Sound as alleged.

Meissner, when describing *L. diversifolia* in Lehm., Pl. Preiss. 1:23 (1844), recognized two varieties which he named var. *longifolia* and var. *brevifolia*. Var. *longifolia* is the typical variety of *L. diversifolia* and the species is lectotypified by the Drummond collection from near Swan River in Herb. Shuttleworth housed in BM.

The leaves in subsp. *lanceolata* are either unifoliolate or trifoliolate; in the latter instance the lateral leaflets are disproportionately smaller than the central leaflet. Unifoliolate specimens are found throughout the distributional range of subsp. *lanceolata* but tend to occur more frequently in the north.

Most specimens can be referred readily either to subsp. *lanceolata* or to subsp. *brevifolia*. However, occasional specimens, for example *C. E. Woolcock s.n.* (MEL 627871) from 5.5 km from Toodyay and *E. Pritzel 554* (AD, W) from the Avon district, are difficult to place with certainty. These specimens are atypical in having some 4-foliolate leaves as in subsp. *brevifolia* but, as they have the general facies of subsp. *lanceolata* with the central leaflet very much larger than the laterals, they are referred to subsp. *lanceolata*.

Subsp. *lanceolata* usually grows as a fairly large open shrub whereas subsp. *brevifolia* tends to be dense and more intricately branched.

L. lanceolata subsp. **brevifolia** (Meissner) J. H. Ross, comb. et stat. nov.
L. diversifolia Meissner var. *brevifolia* Meissner in Lehm., Pl. Preiss. 1:23 (1844). TYPE: Western Australia, "Montis Bakewell .... et ad fluv. Canning", *Preiss 1027* (LD, here selected as lecto., MEL 626657, MEL 626658, NY, isolecto.).
L. diversifolia sensu Lindley & Paxton, Fl. Gard. 2:t. 52 (1851).
L. lanceolata Benth., Fl. Austral. 2:293 (1864) pro parte excl. specim. Huegel.

Leaves (3-)4-6-foliolate; the central leaflet 1.1-6 cm long, 0.2-1 cm wide; lateral leaflets 0.6-1.5 cm long, 0.175-0.5 cm wide.

Occurs mainly from the Darling Range east and south-east of Perth inland to the vicinity of Kellerberrin (with outliers further north) and south-eastwards to Israelite Bay and some of the islands of the Recherche Archipelago. Recorded from a variety of habitats including the sandy soil of creek beds, granite outcrops, sandy loam, granitic soil and coastal heath.

REPRESENTATIVE SPECIMENS (total number examined, 91):
Western Australia — Kellerberrin, ix.1897, *R. B. Leake s.n.* (PERTH). Mt Bakewell, 24.ix.1961, *A. S. George 3050* (PERTH). Avondale Research Station, 6 km W. of Beverley, 22.x.1979, *R. J. Hnatiuk 790185* (PERTH). Pingelly, 27.x.1921, *C. A. Gardner 1017* (PERTH). Near John's Cove, Bremer Bay, 2.x.1981, *M. G. Corrick 7668* (MEL 605109). Young River crossing ca. 5 km N. of Neds Corner, 27.ix.1968, *N. N. Donner 2810* (AD 97118044, PERTH). Tagon Harbour, Cape Arid National Park, 3.xii.1971, *R. D. Royce 10043* (PERTH). Recherche Archipelago, Sandy Hook Island, 10.xi.1950, *J. H. Willis s.n.* (MEL 626654).

Fig. 7. The known distributions of *Labichea lanceolata*, *L. obtrullata* and *L. rupestris*.

NOTES:

L. diversifolia Meissner var. *brevifolia* Meissner was based on two Preiss collections numbered 1027 which were cited in the protologue as follows: "Inter fragmenta rupium (Quartz) ad latus occidentale montis Bakewell (York) et in rupestribus as fluv. Canning (Darling's Range) d. 8 Sept. 1839 et M. Jul. 1841. Herb. Preiss. No. 1027". Specimens of *Preiss 1027* housed in LD, MEL, NY and W have been examined: there are none at K. The specimen labelled *Preiss 1027* in W is referrable to *L. lanceolata* subsp. *lanceolata:* the specimen does not belong with the label which has Huegel's printed name crossed out and substituted with Preiss's and an abbreviated version of the locality data cited in the protologue. The specimen in LD is accompanied by a label in Preiss's hand, one of the MEL sheets (MEL 626657) is from Steetz's herbarium and the other MEL sheet (MEL 626658) is from Lehmann's herbarium. The label on the NY specimen is not in Meissner's hand and there is no obvious evidence to suggest that it formed part of Meissner's herbarium. The MEL sheet from Steetz's herbarium bears the locality Canning River, the MEL sheet from Lehmann's herbarium has a reference to the protologue, and the labels of the specimens in LD and NY have both Mt Bakewell and Canning River as given in the protologue and there is no means of knowing from which of the two localities the specimens came. I now select the sheet of *Preiss 1027* in LD as the lectotype of *L. diversifolia* var. *brevifolia*.

In subsp. *brevifolia* some leaves are occasionally 3-foliolate but these are always accompanied by leaves with 4-6 leaflets.

Four specimens from outlying localities north of the main distributional range of subsp. *brevifolia* have narrower leaflets than usual and a somewhat different facies as a consequence. The specimens in question are *A. C. Burns 98* (PERTH) from East Yuna which is separated apparently from other populations by a large geographical discontinuity, *C. A. Gardner 12149* (PERTH) from Ninghan, *C. A. Gardner 12126* (PERTH) from Waddourin Hill and *W. E. Blackall 3400* (PERTH) from south of Bencubbin. Although atypical, for the present the specimens are referred to subsp. *brevifolia* pending further investigation.

10. **Labichea obtrullata** J. H. Ross, sp. nov.

Species nova L. lanceolatae Benth. affinis, a qua foliis semper 3-foliolatis cum foliolis lateralibus plerumque late obtrullatis differt.

TYPE: Western Australia, Gabyon Station, W. of Yalgoo, Oct. 1963, *D. W. Goodall s.n.* (PERTH, holo.).

Shrub (?), young branchlets slightly flattened apically, glabrous or sparingly clothed with short erect uncinate hairs and longer appressed to slightly spreading hairs. *Leaves* digitately 3-foliolate, the central leaflet longest, distinctly petiolate: petiole 0.2-0.55 cm long, glabrous or sparingly clothed with uncinate and/or appressed hairs; leaflets coriaceous, upper surface with scattered uncinate hairs or glabrous, lower surface with scattered uncinate hairs and/or appressed hairs especially on the margins and midrib; central leaflet petiolulate, elliptic- or narrow-oblong, 3.3-7.5 cm long including the pungent tip, 0.75-1 cm wide; lateral leaflets sessile, very variable in shape, mostly ± very broadly obtrullate (up to 3.8 cm long and 2.2 cm wide), the three angles terminating in pungent points, sometimes with 4 points or ± obreniform with 2 pungent points, occasionally narrow-elliptic (up to 0.8 cm long and 0.25 cm wide) with a pungent tip. *Stipules* narrow-triangular, 1.25-2 x 0.8-1.25 mm, deciduous. *Racemes* 3-7-flowered, longer than the leaves; bracts ovate, up to 1.75 x 1.25 mm, pubescent, deciduous. *Pedicels* 4-7 mm long, with short erect uncinate hairs and longer usually dark scattered appressed hairs. *Sepals* 4 or 5, the 2 outer 9-12.5 x 3-4 mm, clothed with short erect uncinate hairs and longer dark appressed hairs, the inner 2(3) sepals (4.5)6-10.5 x (1.4)2.75-4.5 mm. *Petals* 4, 7.5-11 x 5.8 mm. *Stamens* unequal, one anther much longer than the other; filaments 0.5-0.75 mm long; short anther 4-5 mm long, long anther 5.3-8.5 mm long. *Ovary* up to 3 mm long, 2-ovulate, densely clothed with short erect uncinate hairs and longer dark appressed hairs. *Pods* and *seeds* unknown (Fig. 8).

Known only from two rather poor specimens, one of which is sterile, from Gabyon Station, west of Yalgoo, Western Australia (Fig. 7). Ecological preferences and conservation status unknown.

SPECIMEN EXAMINED:
Western Australia — Gabyon Station, 15.vi.1962, *D. G. Wilcox s.n.* (PERTH).

NOTES:
Allied to *L. lanceolata* but readily distinguished from it by the distinctive lateral leaflets which are mostly ± very broadly obtrullate. The lateral leaflets exhibit some variation in shape and occasionally have four pungent points instead of three, are ± obreniform with two pungent points, or are simply narrow-elliptic. The ± broadly obtrullate or ± obreniform lateral leaflets appear to have arisen by the lateral fusion of individual elliptic leaflets.

An attempt to locate *L. obtrullata* during the spring of 1982 was unsuccessful largely owing to the lack of a precise locality on the vast Gabyon Station from which the two previous collections were taken. *L. obtrullata* appears to have a very restricted distribution.

More material, especially fruiting material, is desired.

11. **Labichea rupestris** Benth. in Mitch. J. Exped. Trop. Australia 342 (1848); Fl. Austral. 2:293 (1864) pro parte excl. syn. *L. digitata*. TYPE: Queensland, 24°03′ S, 144°42′ E, 24 Sept. 1846, *T. L. Mitchell 307* (K, lecto, CGE isolecto.).

Shrub to 1.5 m high, young branchlets usually clothed with a mixture of short erect uncinate hairs and appressed or slightly spreading hairs up to 0.6 mm long. *Leaves* digitately 3-5-foliolate, subsessile, the central leaflet of each leaf disproportionately larger than the others; leaflets narrow-oblong to narrow-elliptic or narrow-obovate-oblong, petiolulate, discolorous, reticulately veined, upper surface with numerous tubercular-based erect or uncinate hairs, lower surface usually with scattered long appressed hairs especially on the midrib and sometimes with short tubercular-based erect or uncinate hairs; central leaflet 2.5-9 cm long including a pungent tip up to 0.3 cm long, 0.3-0.7 cm wide; lateral leaflets 0.7-4 cm long, 0.3-0.6 cm wide. *Stipules* narrow-triangular, 1.2-2.5 mm long, 0.7-1 mm wide, deciduous. *Racemes* 3-18-flowered, mostly shorter than the leaves, densely clothed with appressed-decumbent hairs; bracts ovate, up to 1.5 x 1 mm, deciduous. *Pedicels* up to 4 mm long, pubescent. *Sepals* 4 (rarely 5), the 2 outer 4.8-6.9 x 2-2.9 mm, acute apically, sparingly to densely clothed with short erect uncinate hairs and longer appressed straight hairs, the inner 2 (3) sepals 4-6.5 x (1.5)2-2.8 mm. *Petals* 4 (rarely 5), 3.2-6.5 x (0.8)1.8-5 mm (an occasional

Fig. 8. *Labichea obtrullata*. a — flowering twig, x 1. b — portion of vegetative twig showing some of the variation in the lateral leaflets, x 1. c — flower, x 3. d — stamens and gynoecium, x 6. a, c & d from *D. W. Goodall s.n.* (PERTH); b from *D. G. Wilcox s.n.* (PERTH).

flower has a linear appendage up to 0.4 x 0.1 mm at the base of the ovary). *Stamens* almost equal in length, filaments 0.4-0.6 mm long; anthers 2.5-4.5 mm long. *Ovary* 2.5-3.5 mm long, 2-ovulate, densely villous. *Pods* obliquely elliptic-oblong, 2-2.8 x 1-1.4 cm, narrowed to an acute beak apically, clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seeds* 5-6 mm long, 3.5-4 mm wide, 2.5-2.8 mm thick.

Confined to east-central Queensland where apparently it has a disjunct distribution being recorded from between Hughenden and Charters Towers in the north and from north-west of Blackall to north-east of Rolleston in the south (Fig. 7). The ecological preferences are not clear but the species is reported to occur on sandstone, among rocks and on creek banks in open woodland and scrub.

REPRESENTATIVE SPECIMENS (total number examined, 9):
Queensland — Torrens Creek, 19.iii.1933, *C. T. White 8684* (BRI 285091). Warrigal Creek, 27 km W. of Pentland on Townsville — Mt Isa rd., 17.iii.1980, *R. H. Rebgetz 385* (BRI 254083). Cape River, *Bowman s.n.* (MEL 616544). Planet Creek, 48 km NE. of Rolleston Township, 30.ix.1962, *Story & Yapp 306* (CANB 115546, MEL 616543, NSW).

NOTES:
The first mention of *L. rupestris* in Mitchell's journal is on 6 Oct. 1846 and the protologue appears in a footnote on p. 342. On 6 October Mitchell travelled from NW. of Mt Pluto eastwards towards Mt Salvator to his camp of the Pyramids (roughly 25°S, 147° 20′ E).

I have not seen a specimen dated 6 Oct. collected by Mitchell but undated specimens are present in CGE and K. The only Mitchell specimen of *L. rupestris* bearing a date that I have examined is number 307 collected on 24 Sept. when he was considerably further west (24°03′ S, 144°42′ E) than he was on 6 Oct. when the species was described in his journal. Although Mitchell does not mention in his journal having seen *L. rupestris* on 24 September, specimen no. 307 in K collected on 24 Sept. 1846 is selected here from among the specimens collected by Mitchell as the lectotype of *L. rupestris.*

Bentham, Fl. Austral. 2:293 (1846), considered *L. rupestris* and *L. digitata* to be conspecific but the two species are distinct and the differences are listed in Table 2.

12. **Labichea digitata** Benth. in Mitch. J. Exped. Trop. Australia 273 (1848). TYPE: Queensland, ± 24°52′ S, 146°42′ E, 14 Sept. 1846, *T. L. Mitchell 351* (K, lecto, CGE isolecto).

L. rupestris sensu Benth., Fl. Austral. 2:293 (1864) pro parte quoad syn. *L. digitata,* non sensu stricto.

Shrub to 1 m high, young branchlets usually densely clothed with spreading hairs up to 0.6 mm long, rarely the hairs somewhat appressed. *Leaves* digitately 5(7)-foliolate, on petioles up to 1.5 mm long, leaflets of each leaf roughly the same size, the central one not

Table 2. Diagnostic differences between *Labichea rupestris* and *L. digitata.*

	L. rupestris	L. digitata
young branchlets	usually clothed with a mixture of short erect uncinate hairs and longer appressed or slightly spreading hairs	usually densely clothed with spreading hairs, rarely the hairs somewhat appressed
leaves	subsessile; 3-5-foliolate	on petioles up to 1.5 mm long; 5(7)-foliolate
leaflets	the central leaflet of each leaf disproportionately larger than the others; central leaflets 2.5-9 cm long, 0.3-0.7 cm wide	the central leaflet of each leaf not disproportionately larger than the others, the leaflets roughly the same size, 1.2-3 cm long, 0.2-0.35 cm wide
bracts	up to 1.5 x 1 mm	2.5-6 x 2.25-7 mm, conspicuously longitudinally striate
pods	obliquely elliptic-oblong, 2-2.8 cm long, 1-1.4 cm wide	obliquely ovate, 1.4-1.7 cm long, 0.7-0.9 cm wide

disproportionately larger than the others as in *L. rupestris;* leaflets narrow-elliptic, 1.2-3 cm long including the pungent tip up to 3 mm long, 0.2-0.35 cm wide, subsessile, discolorous, prominently reticulately veined, upper surface with scattered tubercular-based uncinate hairs, lower surface usually with scattered appressed hairs especially on the midrib and sometimes with short tubercular-based uncinate hairs. *Stipules* narrow-triangular, up to 1.5 x 0.75 mm, deciduous. *Racemes* 2-9-flowered, mostly shorter than the leaves, densely clothed with rusty appressed hairs; bracts broadly ovate, 2.5-6 mm long, 2.25-7 mm wide; conspicuously longitudinally striate, usually with marginal cilia and rusty appressed hairs along the midrib. *Pedicels* up to 1.5 mm long, rusty appressed-pubescent. *Sepals* 4, the 2 outer 5-6.5 x 1.9-2.5 mm, densely clothed with appressed rusty hairs and scattered short erect uncinate hairs, the 2 inner sepals 4-6 x 1.8-2.7 mm. *Petals* 4 (seldom 5), 3.8-6.6 x (1)1.7-5.5 mm (an occasional flower has one or two linear appendages at the base of the ovary). *Stamens* almost equal in length, filaments 0.5-0.75 mm long; anthers 2.7-4 mm long. *Ovary* up to 2.5 mm long, 2-ovulate, densely villous. *Pods* obliquely ovate, 1.4-1.7 x 0.7-0.9 cm, narrowed to an acute beak apically, clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seeds* (immature) 5 x 3 mm.

Confined to south-eastern Queensland where apparently it has a disjunct distribution being recorded from the vicinity of Mt Pluto and Mt Playfair in the north and Miles and Chinchilla in the south (Fig. 9). The ecological preferences are not clear but the species has been recorded growing on gravelly clay loam and sandy loam overlaying sandstone in open forest.

Representative Specimens (total number examined, 15):

Queensland — Mt. Playfair, 1890, *Mrs Biddulph s.n.* (MEL 616541). Nogoa River, 16 km E. of Mt. Playfair, vii.1966, *C.H. Gittins 1148* (BRI 64469). 4 km S. of Miles, 4.ix.1973, *G.W. Trapnell & K.A. Williams 327* (BRI 192541). 6.1 km NNW of Chinchilla towards Auburn, 29.viii.1975, *R. Coveny 6805 & P. Hind* (BRI 217190, NSW).

Notes:

The first mention of *L. digitata* in Mitchell's journal is on 11 Aug. 1846 when he was at approximately 22°S, 147°E, and the protologue appears in a footnote on p. 273. *L. digitata* is mentioned subsequently on pp. 339 and 340 on 6 Oct. when Mitchell was east

Fig. 9. The known distributions of *Labichea digitata, L. punctata* and *L. stellata.*

of Mt Pluto. The reference on p. 339 is to *L. digitata* being in fruit and presumably this is when *Mitchell 381* was collected although the specimen in CGE bears the date "Oct. 5". The K sheet, in contrast, has the date "Oct. 5" crossed out.

Apart from the reference to *L. digitata* on 6 October when Mitchell travelled from NW. of Mt Pluto to the camp of the Pyramids (roughly 25°S, 147°20′ E), the only Mitchell specimens seen bearing dates are number 300 in K dated "Aug." and number 351 in CGE and K dated "Sept. 14". Mitchell does not mention in his journal having seen *L. digitata* on 14 September when he travelled westward from "The Gap" (24°52′ S, 146°42′ E) and was at least 100 km further west than he was on 6 October. A third Mitchell specimen in CGE and K carries neither date nor number. Specimen no. 351 in K collected on 14 Sept. 1846 and carrying the comment "Foot of rocks in sheltered ravine" is selected here from among the specimens collected by Mitchell as the lectotype of *L. digitata*.

Mitchell's first mention of *L. digitata* on 11 Aug. is from a locality which is much further north than the other known occurrences of the species and confirmation of the existence of the species so far north is required.

One of the flowers of *Mitchell 351* dissected had 5 petals, the fifth being oblong and 4.7 x 1 mm. In other flowers on this specimen one or two linear filaments up to 0.9 x 0.2 mm were found at the base of the ovary.

L. digitata is allied most closely to *L. stellata* from south-western Western Australia and *L. rupestris* from Queensland. The characters that distinguish *L. digitata* from each are given under *L. stellata* and *L. rupestris* respectively.

13. **Labichea stellata** J. H. Ross, sp. nov.

Species nova L. digitatae Benth. affinis, a qua pilis ad 1.75 mm longis in ramulis juvenilibus, petiolis, et saepe costis paginae inferioris; foliis manifeste subdigitatis petiolatis; foliolorum forma; et floribus cum 5 sepalibus, differt.

Type: Western Australia, c. 30 km N. of Hyden along road to Narembeen, 13.ix.1982, *P. S. Short 1724c* (MEL 629305, holo.; K, PERTH, iso.).

Shrub to 1 m high, often wider than high; young branchlets clothed with spreading hairs up to 1.5 mm long and scattered shorter erect uncinate hairs. *Leaves* sub-digitately 5(7)-foliolate, petiolate, the 2 lower leaflets inserted just below the others, the leaflets of each leaf ± the same size; petiole 1-5 mm long, sparingly to densely clothed with spreading hairs and scattered shorter erect uncinate hairs; leaflets narrow-elliptic, 0.7-2.2 cm long including the pungent tip up to 3 mm long, 0.2-0.5 cm wide, sessile, margins revolute, upper surface with scattered tubercular-based uncinate hairs, lower surface glabrous except for scattered hairs up to 1.75 mm long on the midrib and sometimes on the margins. *Stipules* ovate, 3-4 mm long, 1-2.2 mm wide, tardily deciduous. *Racemes* 3-9-flowered, pendulous, longer than the leaves, densely clothed with short spreading uncinate hairs; bracts ovate, 3-4.5 x 2.75-3.5 mm, with scattered uncinate hairs, deciduous. *Pedicels* up to 2 mm long, with short erect uncinate hairs. *Sepals* 5, the outer ones 4.5-7 x 1.5-2.8 mm, acute apically, sparsely clothed with short erect uncinate hairs, the inner sepals 4.5-5.5 x 1-1.8 mm. *Petals* 4, unequal and one sometimes ± oblong, 3.3-6 x 1.5-6 mm. *Stamens* ± equal in length, filaments 0.5-0.75 mm long; anthers 3.2-4.5 mm long, with apical pores. *Ovary* up to 2.5 mm long, 2-ovulate, densely clothed with short uncinate hairs and long villous hairs. *Pods* (only immature pods seen) obliquely oblong-elliptic, 1.1-1.5 x 0.6-0.7 cm, narrowed to an acute beak apically, densely clothed with short erect uncinate hairs and scattered longer hairs (Fig. 10).

Confined to south-western Western Australia where it occurs from the vicinity of Koonadgin in the north southwards to Hyden, south-westward to Lake Grace, and eastward to North Ironcap and Middle Ironcap (Fig. 9). Recorded growing in crevices between ironstone boulders on exposed slopes in low heath or with mallee *Eucalyptus-Acacia-Casuarina*-Proteaceae-Myrtaceae shrubs, and in laterite and coarse sandy loam in disturbed roadside localities. Apparently a coloniser of disturbed sites.

Representative Specimens (total number examined, 18):

Western Australia — 6.69 km (4.18 miles) from Koonadgin on the road to Korbel, 16.xi.1983, *B. H. Smith 308* (MEL 650838). Eastern face of North Ironcap, 12.ix.1982, *P. S. Short 1700a* (CANB, MEL 629307, PERTH).

Fig. 10. *Labichea stellata*. a — flowering twig showing pendulous inflorescences, x 1. b — leaf, x 2. c — portion of lower leaflet surface showing scattered long hairs on the midrib and margin, x 6. d — portion of young stem showing spreading hairs, x 6. e — flower, x 4. f — stamens and gynoecium, x 8. All from *P. S. Short 1724c* (MEL 629305).

Middle Ironcap, 12.x.1976, *G. J. Keighery 896* (KINGS PARK). Lake Grace district, 22.ix.1967, *P. Nelson s.n.* (PERTH). S. of Lake Grace, 8.x.1965, *R. D. Royce s.n.* (PERTH).

NOTES:

Allied to *L. digitata* from south-eastern Queensland from which it differs in having flowers with 5 sepals, the young branchlets, shoots, petioles and often the lower surface of the midribs of the leaflets clothed with spreading hairs up to 1.75 mm long, subdigitate leaves, and differently shaped leaflets. The leaflets spread giving the leaves a star-like appearance, whence the specific epithet.

14. **Labichea punctata** Benth. in Lindley, Sketch Veg. Swan Riv. Col. 15 (1839); Benth., Fl. Austral. 2:294 (1864). TYPE: Western Australia, Swan River, *Drummond* (K, here selected as lectotype).

L. punctata var. *lanceolata* Meissner in Lehm., Pl. Preiss. 1:24 (1844). TYPE: Western Australia, near Mahogany Creek, Darling Range, 23 Sept. 1839, *Preiss 1025* (LD, here selected as lecto.; K; MEL 608357, 608358, 608360; W, isolecto.).

Shrub or *subshrub* to 1 m high, stems simple or sparingly branched, erect or prostrate, flattened apically, glabrous to fairly densely clothed with appressed and uncinate hairs. *Leaves* unifoliolate, linear, narrowly elliptic or ovate, the basal ones sometimes larger than the upper, (1.8)4.5-9(12.5) cm long, (0.3)0.5-1.7(3.1) cm wide, pungent apically, reticulate, with scattered tubercular-based uncinate hairs above and occasionally below, otherwise glabrous or with scattered appressed hairs below especially on the midrib; petiole 0.2-0.4 cm long, sulcate adaxially, wrinkled. Stipules narrowly triangular or subulate, 2.5-5 x 0.7-1 mm, glabrous or sparingly pubescent, usually persisting for some time. *Racemes* 3-many-flowered, usually shorter than the subtending leaf; bracts ovate, 2.5-3.5 x 1.5-3 mm, soon deciduous. *Pedicels* 6-9 mm long, sparingly to densely clothed with uncinate hairs. *Sepals* (4)5, becoming reflexed, the 2 outer ones 6.5-10 x 2.4-3.8 mm, acute apically, sparingly to densely clothed with uncinate and sometimes scattered appressed hairs, the 2(3) inner sepals 6-9 x 2.1-3.5 mm. *Petals* 4, 6-12 x 5-11.5 mm, occasionally sparingly puberulous basally. *Stamens* ± equal in length; filaments 0.6-1 mm long; anthers 3.8-5.5 mm long. *Ovary* 2.5-3.5 mm long, densely villous; *style* 3 mm long. *Pods* obliquely oblong-elliptic, 2.3-3.3 x 0.9-1.4 cm, narrowed to an acute beak apically, densely clothed with short erect uncinate hairs and longer scattered appressed hairs. *Seeds* chestnut-brown, 5-5.5 mm long, 3.75-4.5 mm wide, 3-3.5 mm thick. (Fig. 11).

Occurs in heath and woodland on sandy soils of the coastal plain in south-western Western Australia from Cowaramup to Jurien and on sandy and lateritic soils of the Darling Range (Fig. 9).

REPRESENTATIVE SPECIMENS (total number examined, 89):

Western Australia — Bunbury, *Oldfield s.n.* (MEL 607407). Gooseberry Hill, Darling Range, 15.ix.1900, *A. Morrison 10426* (MEL 607419, PERTH). Midland, 17.xii.1973, *H. Demarz 5013* (PERTH). Upper Helena Valley, 18.ix.1977, *J. Seabrook 258* (PERTH). Mt Benia, E. of Jurien, 13.ix.1979, *E. A. Griffin 2214* (PERTH).

NOTES:

No type material was mentioned specifically by Bentham in the protologue of *L. punctata* but it is clear that he had before him flowering material. The unnumbered flowering specimen dated 1839 collected by Drummond at Swan River in Herbarium Benthamianum now at K and bearing the name "Labichea punctata Benth." in Bentham's hand is clearly part of the type material or perhaps the sole specimen upon which Bentham based his description. The undated unnumbered flowering specimen in CGE collected by Drummond at Swan River is possibly part of the type collection. It is not known whether the undated flowering specimens of Drummond 279 in MEL and W, and which are no doubt present in several other herbaria, form part of the type material but this is thought to be unlikely. In order to obviate any confusion, the unnumbered Drummond specimen in K referred to above is selected here as the lectotype of *L. punctata*.

The flowers of *L. punctata* invariably have 5 sepals and not 4 as reported in most literature.

Fig. 11. *Labichea punctata*. a — flowering twig, x 1. b — basal portion of leaf showing attachment to stem and paired stipules, x 3. c — flower, x 2. d — stamens and gynoecium, x 8. e — pod, x 1. f — seed showing the globular aril, x 3. a — d from *J. Seabrook 258* (PERTH); e from *F. Mueller s.n.* (MEL 607410); f from *F. Mueller s.n.* (MEL 607412).

L. lanceolata has been confused with *L. punctata*. *L. punctata* differs from *L. lanceolata* in being a low shrub or subshrub with simple or sparsely branched stems and in having consistently unifoliolate leaves, anthers of ± equal size, and a more restricted range of distribution.

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REFERENCE

Beard, J. S. (1980). A new phytogeographic map of Western Australia. *Western Australian Herb. Res. Notes* 3: 37-58.

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MONOCHORIA CYANEA AND M. AUSTRALASICA (PONTEDERIACEAE) IN AUSTRALIA

by

HELEN I. ASTON *

ABSTRACT

Aston, Helen I. *Monochoria cyanea* and *M. australasica* (Pontederiaceae) in Australia. *Muelleria* 6(1):51-57 (1985) — Australian plants generally referred to *Monochoria cyanea* (F.Muell.) F.Muell. have been investigated morphologically and are shown to consist of two entities which are here referred to *M. cyanea* s. str. and to *M. australasica* H. N. Ridley. Typification of these names is discussed and a lectotype is selected for the former.

INTRODUCTION

The genus *Monochoria* C.Presl consists of several species of conspicuous-flowered, emergent, aquatic plants distributed in mainly tropical regions from Africa to Japan and through south-east Asia to Australia. Backer (1951) recognised two sections, viz. sect. *Monochoria* (as *Eumonochoria*) and sect. *Limnostachys* (F.Muell.) Backer. In section *Monochoria* one anther is much larger than the other five and its filament bears a small lateral appendage. In section *Limnostachys* all six anthers are more or less equal in size and there is no lateral appendage to any filament.

The section *Limnostachys* is apparently confined to Australia where all plants belonging to it are currently referred to *Monochoria cyanea* (F.Muell.) F.Muell. A collection from "near Darwin" was described in 1918 as *M. australasica* H. N. Ridley but this name has been considered a synonym of *M. cyanea* (Backer 1951). Backer's suggestion that *M. australasica* is only a submerged or juvenile form is quite incorrect. The present author has investigated certain morphological features and, from the results presented below, has concluded that each of the names *M. cyanea* and *M. australasica* refers to a distinct species.

MORPHOLOGY

Methods

Collections incorporated as *M. cyanea* at BRI, CANB, DNA, MEL, NSW, NT and PERTH were examined. Initial sorting suggested that two taxa were probably represented by the one name and subsequent measurements confirmed this (Figs 1 to 3). Measurements of floral parts were made on material softened in boiling water with a little teepol added, or, in a few cases, were made from flowers preserved in 70% alcohol or in FAA solution. All other measurements were made from dried specimens.

The following characters need explanation:

Leaf — the leaf subtending the inflorescence, not basal leaves.

Petiole — that portion of the inflorescence leaf lying between the sheath and the blade.

Sheath — includes the small ligule.

Raceme — from the attachment of the lowest flower to the outer extremity of the extended, apical flower.

Filament — measured along its midvein from the point where the filament first joins the anther to the point where it unites to the perianth. This avoids inconsistencies which would have arisen if only the free portions of the irregularly-united filaments had been measured. Average measurement of 4-6 filaments in the one flower was used.

Anther — average of 4-6 anthers in the one flower was used (anthers and filaments were not always all present or in a measureable state).

Style plus stigma — the length along the style curvature. Includes the majority of the stigmatic papillae.

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

Filament lengths and anther lengths of each flower were initially averaged for plotting and the anther/filament % ratio was calculated using these averages. This was done in order to indicate any between-flower variation. These averages were also used in selecting the values given in Table 1. Subsequently the lengths and ratio were recalculated using individual rather than average measurements. The results gave only slight expansion of the standard deviations to those obtained initially and indicate that the averages used in this study have portrayed genuine distinctions equally as well as individual measurements. The data based on individual measurements are:

M. cyanea — Anther: mean 1.8, S.D. 0.4, range 1.2-3.4, n = 327. Filament: mean 3.6, S.D. 0.7, range 1.8-5.7, n = 271. Anther/filament %: mean 49, S.D. 11, range 26-88, n = 101.

M. australasica — Anther: mean 4.0, S.D. 0.7, range 2.0-5.6, n = 155. Filament: mean 2.9, S.D. 0.7, range 1.2-5.0, n = 96. Anther/filament %: mean 134, S.D. 35, range 83-235, n = 38.

Results

Recognition of *M. cyanea* and *M. australasica*

Working graphs showed that five of the characters examined each segregated upon plotting into two groups with nil or only minor overlap between the groups. These characters were the average length of anther, length of style plus stigma, and the ratios of anther length/filament length, anther length/tepal length and petiole length/sheath length. For each character, values were selected for distinguishing its two groups, which I now refer to *M. cyanea* (F. Muell.) F. Muell. s. str. and *M. australasica* H. N. Ridley (Table 1).

Table 1. The five major characters and their values used in segregating collections of *Monochoria cyanea* and *M. australasica*.

	Monochoria cyanea	Monochoria australasica
Style + stigma (length)	< 6 mm	⩾ 6 mm
Anther (average length)	< 3 mm	⩾ 3 mm
Anther/filament % (lengths)	⩽ 80	⩾ 100
Anther/tepal % (lengths)	⩽ 16	> 16
Petiole/sheath % (lengths; inflorescence leaves only)	> 40	⩽ 20

Of the 150 collections for which four or five of the above characters were available, 146 (97%) had at least four of the characters fitting the values shown in table 1 for either *M. cyanea* or *M. australasica*. Of the 129 collections which had all five characters measureable 117 (91%) fitted the selected values for either *M. cyanea* or *M. australasica* in all five and a further 8 (6%) fitted one or other of the species in four of the five characters and had only a marginal misfit in the fifth character. Only 4 (3%) of the 150 collections showed mixed character values and were not readily assignable to either species.

The ready segregation of the great majority of collections on the basis of five separate characters justifies, in my opinion, the recognition of two distinct species.

It is interesting to note that Verdcourt (1960), working with African *Monochoria* in the section *Monochoria,* a traditionally difficult group for taxonomists, also used the shortness of the petiole above the sheath of the inflorescence leaf as a feature to distinguish a new species *M. brevipetiolata*. This is the most easily noticeable of the five characters used in the present study for distinguishing *M. australasica* from *M. cyanea*.

Variation Within *M. australasica*

Distribution maps (Figs 4 and 5) show that the geographical ranges of *M. cyanea* and *M. australasica* are almost mutally exclusive and that the latter species apparently has two disjunct centres of occurrence, one in the north of the Northern Territory and one on Cape York Peninsula, Queensland. The Queensland collections of *M. australasica* tend to be intermediate in some of their vegetative and inflorescence characters between those of typical *M. australasica* from the Northern Territory and *M. cyanea*. For each character which exhibits this tendency a separate bar for each of the geographical centres of *M. australasica* is included in the measurement charts (Figs 1 to 3). These charts illustrate the following statements:

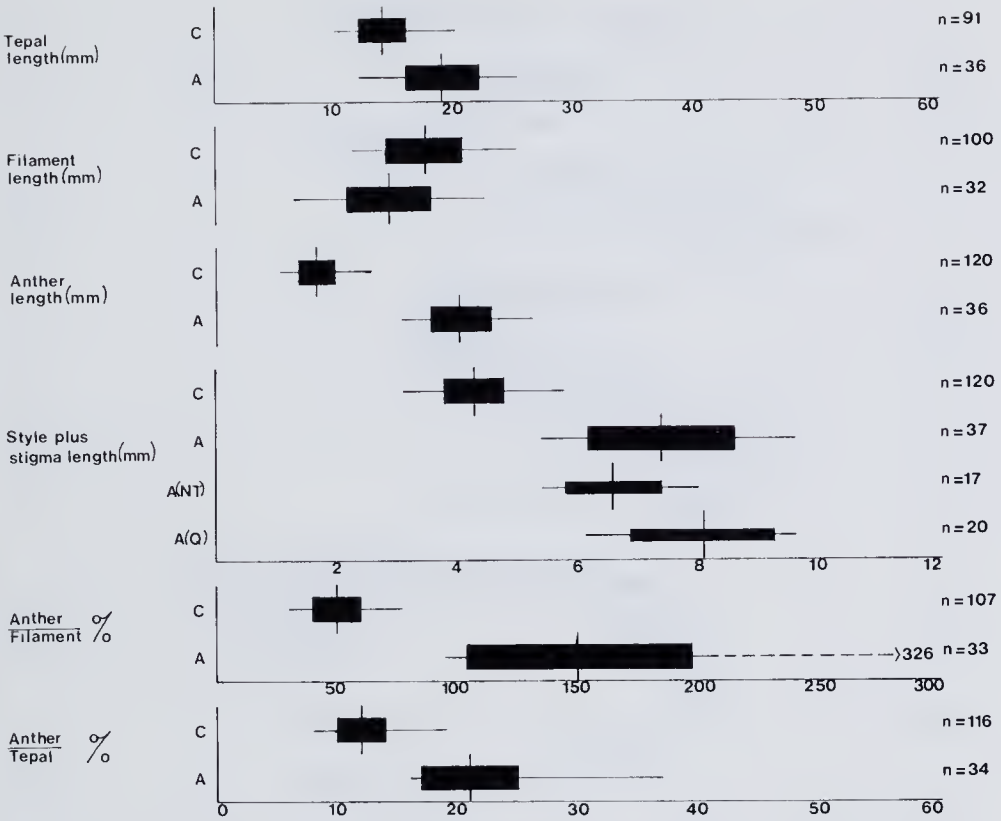

Fig. 1. Measurements and proportions of floral parts in *Monochoria*. Note that anther and filament lengths refer to the averages of the lengths for each flower. Mean, range and standard deviation charted — where necessary a dotted line is used to connect the usual range to a solitary anomalous extreme; n = number of measurements.

C = *M. cyanea*
A = *M. australasica*, all collections.
A (NT) = *M. australasica*, Northern Territory collections only.
A (Q) = *M. australasica*, Queensland collections only.

Leaf — The inflorescence leaf blades of typical Northern Territory populations of *M. australasica* are narrow with the width usually only 6-26% of the blade length. Contrastingly, in *M. cyanea* the blade width is usually 32-55% of the length. Queensland plants of *M. australasica* show an intermediate value of 19-45%.

Sheath lengths on inflorescence leaves of Queensland populations of *M. australasica* are usually less than those of Northern Territory plants, therefore tending toward the short sheaths of *M. cyanea*.

Inflorescence — The absolute lengths of the peduncle and the raceme of Queensland populations of *M. australasica* are usually less than those lengths in Northern Territory populations and tend to be intermediate in length between the latter and the short peduncles and racemes of *M. cyanea*. There is, however, no significant difference in the ratio of raceme length to peduncle length between the Queensland and Northern Territory populations.

The number of flowers per raceme is similar in both the Queensland and Northern Territory collections of *M. australasica* but, because of the usually shorter raceme of the former, the distance between the flowers (represented by raceme length divided by number of flowers) is usually a little less in Queensland collections. This tendency is toward the often very densely crowded flowers of *M. cyanea*.

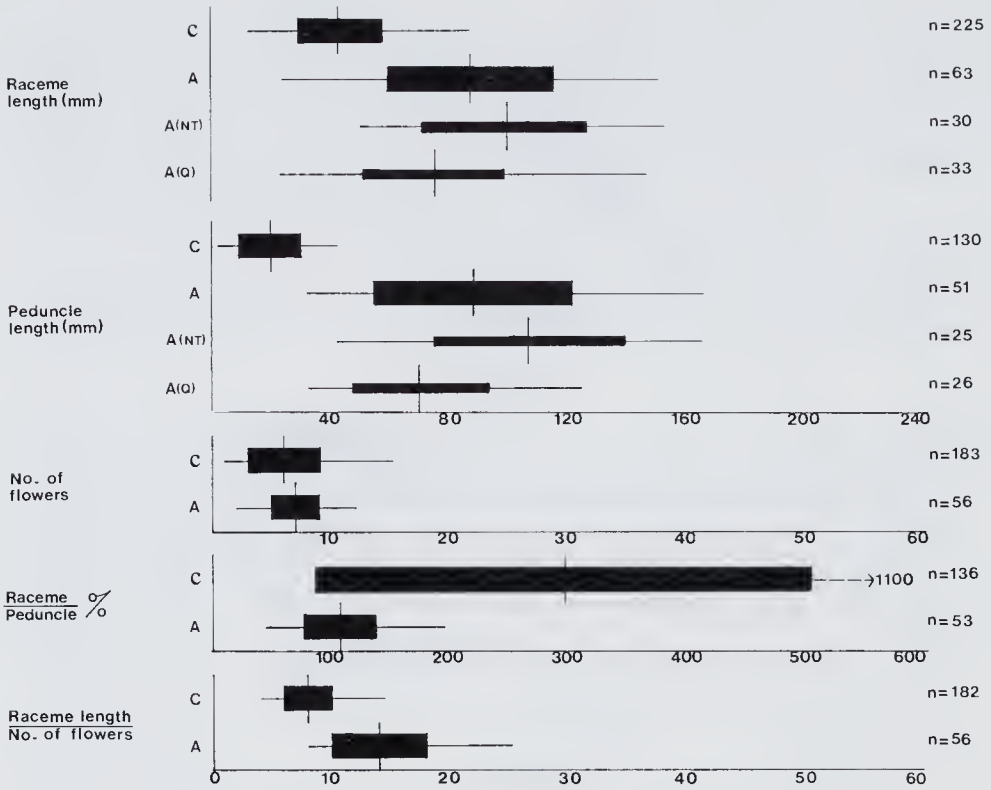

Fig. 2. Measurements and proportions of the inflorescence in *Monochoria*. For explanation see caption to figure 1.

Style plus stigma — Queensland collections of *M. australasica* exhibit longer style plus stigma measurements than those of Northern Territory collections, thereby showing a tendency away from the much shorter style plus stigma lengths of *M. cyanea*. Note that this reverses the direction of the tendencies shown by leaf and inflorescence characters.

Although collections of *M. australasica* from Queensland display some differences from those from the Northern Territory, the magnitude of the differences is small and the overlap in measurements is considerable. The number of measurements of any one character for either area was also limited, varying from 17 to 33, and it has not been possible to critically examine or measure any populations in the field. The apparent differences between Northern Territory and Queensland populations may or may not prove to be real when more collections become available and on present knowledge there is no justification for suggesting any infraspecific taxa within *M. australasica*.

TYPIFICATION

Monochoria australasica Ridley, J. Straits Branch Roy. Asiat. Soc. 79:100 (1918). TYPE: "North Australia; near Darwin 8. (C.E.F. Allen. Nov. 1914.)". HOLOTYPE: "81 C.E.F. Allen Water Hyacinth Feb 14" on field label, "N. Australia: near Darwin. 81. Monochoria Coll. C.E.F. Allen. Rec. 4, Nov. 1914." on Herb. Kew label (K, photo only seen). ISOTYPE: "81 C E F Allen Water Hyacinth! Feb 14" on field label, "N.T. C E F Allen 81 2-1914" on Herb. NSW label (NSW).

The field labels on both type sheets are in the same distinctive handwriting and virtually identical. They show that the date of collection of the material was February 1914, not

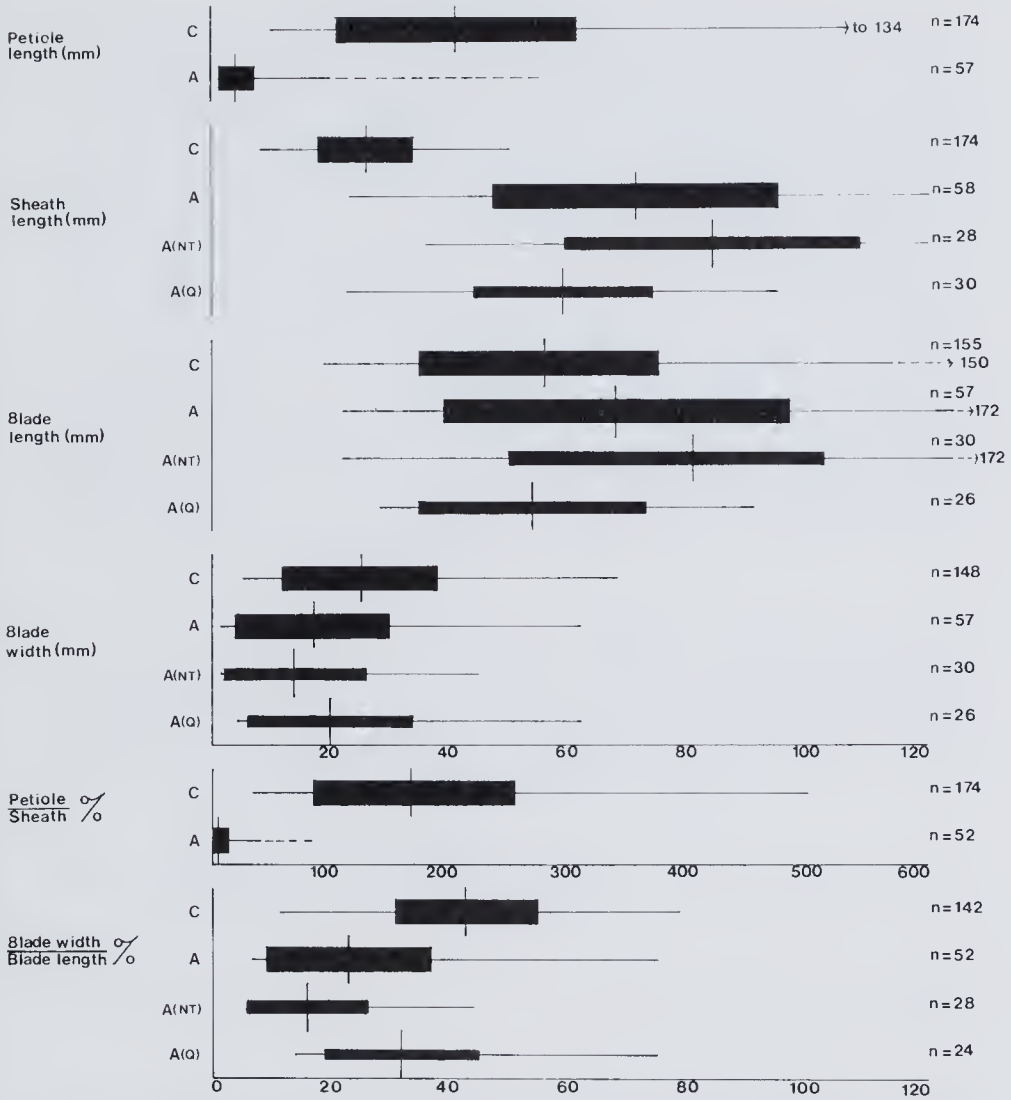

Fig. 3. Measurements and proportions of the infloresence leaf in *Monochoria*. For explanation see caption to figure 1. Note that petiole signifies that portion of the petiole between the sheath and the blade.

November as cited by Ridley, and that the collector's number is 81, not 8 as published. Ridley obviously cited the month of receipt at Kew instead of the month of collection.

The isotype material is visually typical of the narrow-leaved, short-petioled, rather glaucous plants which constitute the *M. australasica* collections from the Northern Territory and, with the width/length % of the leaf blade being only c. 11%, represents the most narrow-leaved forms of these. In addition, except for the slightly short style plus stigma (5.4 mm and 5.5 mm on the two flowers softened), all measurements fall within the standard deviations indicated above for the group. The colour photograph of the holotype sheet agrees well with the isotype material examined.

Monochoria cyanea (F.Muell.) F.Muell., Fragmenta phytographiae Australiae 8:44 (1873). *Limnostachys cyanea* F.Muell., l.c. 1:24 (1858). TYPE: "In terra Arnhem's Land. Leich-

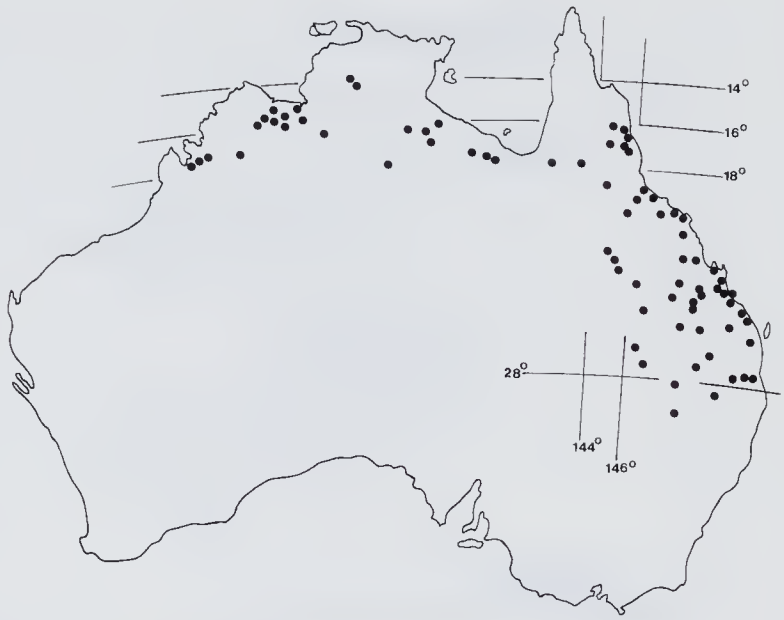

Fig. 4. Distribution of *Monochoria cyanea*.

Fig. 5. Distribution of *Monochoria australasica*.

hardt. Ad flumen Victoriae." LECTOTYPE (here chosen): "Limnostachys cyanea — Victoria River ferd Mueller" in Mueller's hand on plain blue label (K). SYNTYPES: "Pontodera Depot Creek Trop. Australia? Mueller (no label)" on plain blue label in unknown hand (K). "- - - - Rocky basin of Depot Creek April 56. ferd Mueller" on cream-coloured label, also "Monochoria vaginalis Presl Upper Vict. Riv 1856" on blue label, both in Mueller's hand (MEL 665252). "Victoria River ferd Mueller" in Mueller's hand on plain blue label (MEL 665251).

The Kew sheet chosen as lectotype is the only sheet which carries Mueller's identification of *Limnostachys cyanea* and also carries appropriate collection data. Although unstated on the label, the date of collection must have been 1855-56 as that is the only occasion on which Mueller visited the Victoria River. This satisfactorily predates the publication date for the basionym of 1858. The one flowering plant on the sheet is obviously representative of the broad-leaved, long-petioled, *M. cyanea* collections.

Although Mueller cited Leichhardt material from Arnhem Land, no such material has been located at either K or MEL. However, it is possible that the syntype sheet at K could be Leichhardt material as the label information is indefinite and appears to indicate that it

was tentatively provided last century by somebody at K after the sheet was located without any original label. Material on the sheet is somewhat varied in appearance.

The syntype MEL 665252 contains one plant in flower and an isolated basal leaf. The plant is vegetatively smaller than that of the lectotype sheet but equally as representative of *M. cyanea*. The blue label giving Mueller's identification of *Monochoria vaginalis* is possibly erroneously present or else merely indicative of an early identification by Mueller. The locality Depot Creek, shown on the alternative label, is in the vicinity of the Victoria River and supports the acceptance of this collection as some of the original material used by Mueller in describing *Limnostachys cyanea*.

MEL 665251 contains a mixture of plant portions and fragments whose characteristics collectively embrace the range shown by plants on the other three type sheets.

From the total type material eleven measurements were made for each vegetative and inflorescence feature. Floral structures were measured wet from 3 flowers from the MEL sheets, but otherwise were measured dry on both the MEL and K sheets to avoid damage. For most characters the range of measurements obtained embraced all or part of the standard deviation charted above for *M. cyanea* and extended beyond that towards, or sometimes into, the standard deviation shown for *M. australasica* (e.g. style plus stigma = c. 4.5-5.6; anther = c. 2.0-2.8; petiole/sheath = (15-)37-105(-118)%; inflorescence leaf, width/length = 30-62%; spike length/no. of flowers = 4.5-9). That is, the type material consists of plants which, through both measurements and general appearance, undoubtedly belong with *M. cyanea* but tend to be a little atypical of the taxon.

ACKNOWLEDGEMENTS

To Dr K. L. Wilson, National Herbarium of New South Wales, Sydney, and Mr J. R. Clarkson, Mareeba branch of the Queensland Herbarium, for special field collections of *Monochoria,* to Drs J. H. Ross and P. S. Short, National Herbarium of Victoria, for critical comments on a draft manuscript, and to Miss B. J. Sweatman, National Herbarium of Victoria, for preparation of the figures, I am most grateful.

REFERENCES

Backer, C. A. (1951). Pontederiaceae. *Fl. Malesiana* Ser.1., 4:255-261.
Verdcourt, B. (1960). The genus *Monochoria* Presl (Pontederiaceae) in Africa. *Kirkia* 1:80-83, tabs 8-12.

Manuscript received 23 August 1984.

A CONSPECTUS OF NEW RECORDS AND NOMENCLATURE FOR VASCULAR PLANTS IN VICTORIA 3. EARLY 1980 — early 1984

by

MARY A. TODD *

ABSTRACT

Todd, M.A. A conspectus of new records and nomenclature for vascular plants in Victoria 3. Early 1980 to early 1984. *Muelleria* 6 (2): 59-78 (1985). — New records and nomenclatural changes applicable to the vascular flora of Victoria are summarized and relevant publications are cited. The conspectus covers the period from early 1980 to early 1984.

CONTENTS

INTRODUCTION

This conspectus presents a comprehensive list of names, references and new records that have a bearing on the known vascular flora of Victoria and which update information given in Willis (1970, 1973) and in parts 1 and 2 of this series (Todd, 1979 and 1981). It also provides details not presented in "A Census of the Vascular Plants of Victoria" by S.J. Forbes et al (1984).

For new records, brief Victorian distribution data are given together with references to any publication about their occurrence in Victoria. Where changes of nomenclature are proposed, references to papers which discuss the reasons for the proposed name changes are given.

In most ways the information given follows the same form as in parts I and 2. However, in response to requests, the names have been compiled in a single list. New records are indicated by the inclusion of the family name and brief distribution data. The letters at the end of the entry indicate the grid in which the species has been collected. For key to grid references see Churchill & de Corona (1972), Willis (1973) or Todd (1979:174).

Species which are not native to Victoria are indicated by an asterisk (*) in front of the name. When the asterisk is not in brackets the species is regarded as naturalized. If the asterisk is in brackets the species is not yet considered to be naturalized and is better described as a casual introduction.

For proposed new names the information given includes new name, authority, original place of publication, and former name (with indication as to whether it is a basionym, synonym or misused name). Occasionally an additional synonym is given if it has been in wide use. Reference is also made to any recent paper discussing the reason(s) for the change of name.

NEW RECORDS AND CHANGES OF NOMENCLATURE

Acmena smithii (Poir.) Merr. & Perry, *J. Arnold Arbor.* 19: 16 (1938). Basionym: *Eugenia smithii* Poir. Hyland, *Austral. J. Bot. suppl. ser.* 9: 3, 20 (1983), gives reasons for this synonymy and tentatively considers three forms of this taxon. His maps 11-13 (op. cit. 155) show only one form in Victoria.

Actinotus forsythii Maiden & Betche, *Proc. Linn. Soc. N.S.W.* 27: 60 (1902). Umbelliferae (Apiaceae). W7, Brumby Point, Nunniong Plateau, 26.ii.1981 *N.G. Walsh 685* (MEL). See Walsh, *Victorian Naturalist* 99:252-254 (1982).

*C/o National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

Adiantum capillus-veneris L., Sp. Pl. 2: 1096 (1753). Adiantaceae. P24, Main Creek, Mornington Peninsula, 8.ii.1981, *W.R. Archer* (MEL).

Agropyron elongatum (Host) P. Beauv., Ess. Agrostogr. 102 (1812). Synonym: *Elymus elongatus* (Host) Runem., *Hereditas* 70: 156 (1972). Gramineae. N50, Werribee South, 3 m above shoreline, 4.xii.1980, *Paul Fitzimons* (MEL 582904). Also S54.

Agrostis gigantea Roth. See *A. stolonifera* var. *ramosa.*

Agrostis stolonifera L. var. **ramosa** Veldk., *Blumea* 28: 223 (1982). Syn.: *A. gigantea* Roth.

Aira cupaniana Guss., Fl. Sicul. Syn. 1: 148 (1843). Gramineae. C41, Mt. Arapiles, Eagle Gorge area, 26.xi.1968, *A.C. Beauglehole ACB 29832* (MEL 1511083). Also CDEGHJKMNPXZ.

Aira elegantissima Schur, Verh. Mitth. Siebenburg Vereins Naturwiss. Hermanns. 4: 85 (1853). Gramineae. D16, Mt. Bepcha, 10.xii.1965, A.C. Beauglehole ACB 29972 (MEL). Also CJKPW.

Allocasuarina littoralis (Salisb.) L. Johnson, *J. Adelaide Bot. Gard.* 6: 76 (1982). Basionym: *Casuarina littoralis* Salisb.

Allocasuarina luehmannii (R. Baker) L. Johnson, loc. cit. Basionym: *Casuarina luehmannii* R. Baker.

Allocasuarina monilifera (L. Johnson) L. Johnson, loc. cit. Basionym: *Casuarina monilifera* L. Johnson.

Allocasuarina muelleriana (Miq.) L. Johnson, op. cit. 77. Basionym: *Casuarina muelleriana* Miq.

Allocasuarina nana (Sieber ex Sprengel) L. Johnson, op. cit. 77. Basionym: *Casuarina nana* Sieber ex Sprengel.

Allocasuarina paludosa (Sieber ex Sprengel) L. Johnson, op. cit. 77. Basionym: *Casuarina paludosa* Sieber ex Sprengel.

Allocasuarina paradoxa (Macklin) L. Johnson, op. cit. 77. Basionym: *Casuarina paradoxa* Macklin, Kew Bull. 1931: 150 (1931). Lectotype: N52, Cheltenham, v. 1925, Audas, (AD), female infructescences. Johnson states that his earlier determinations of this taxon were largely as "*C. pusilla* ssp. *robusta*" and "*C. pusilla* var. *misera*".

Allocasuarina pusilla (Macklin) L. Johnson, op. cit. 77. Basionym: *Casuarina pusilla* Macklin. Johnson states that "Specimens of this species have largely been determined by him as "*C. pusilla* ssp. *pusilla*". For material determined under other supposed subspecies see the notes on *A. paradoxa* and *A. robusta*".

Allocasuarina robusta (Macklin) L. Johnson, op. cit. 78. Basionym: *Casuarina paludosa* var. *robusta* Macklin. Johnson (loc. cit. and pers. comm.) states that this taxon is restricted to South Australia and that any Victorian specimens which bear either of these names will in general be *A. paradoxa.*

Alsophila australis R. Br. See *Cyathea australis.*

Alsophila cunninghamii (J.D. Hook.) Tryon. See *Cyathea cunninghamii.*

Alsophila marcescens (Wakef.) Tryon. See *Cyathea marcescens* Wakef.

Amaranthus powellii S. Watson. Included as a synonym of *A. hybridus* ssp. *hybridus* by Brenan, *J.S. African Bot.* 47: 457 (1981).

Angianthus burkittii (Benth.) J. Black. See *Gnephosis burkittii* Benth.

Angianthus pusillus (Benth.) Benth. See *Chrysocoryne pusilla* (Benth.) Endl.

Angianthus strictus auct., non (Steetz) Benth. See *Pogonolepis muelleriana.*

Angianthus tenellus (F. Muell.) Benth. See *Chrysocoryne drummondii.*

Anguillaria dioica R. Br. See *Wurmbea dioica* (R. Br.) F. Muell.

Anthocercis albicans A. Cunn. See *Cyphanthera albicans* (A. Cunn) Miers.

Anthocercis frondosa sensu J.H. Willis (1973:558). See *Cyphanthera anthocercidea* (F. Muell.) Haegi.

Anthocercis myosotidea F. Muell. See *Cyphanthera myosotidea* (F. Muell.) Haegi.

(*)**Anthoxanthum aristatum** Boissier, Voy. Bot. Espagne 2: 638 (1842). U48, between Burrowye & Thologolong, 22.i.1981, N.H. Scarlett 81-20, (MEL 584362). Also J47.

Arthrocnemum arbusculum (R. Br.) Moq. See *Sclerostegia arbuscula.*

Arthrocnemum halocnemoides Nees var. **halocnemoides.** See *Halosarcia halocnemoides* ssp. *halocnemoides.*

Arthrocnemum halocenemoides var. **pergranulatum** J. Black. See *Halosarcia pergranulata.*

Arthrocnemum halocnemoides var. **pterygospermum** J. Black. See *Halosarcia pterygosperma.*

Arthrocnemum leiostachyum (Benth.) Paulsen. See *Halosarcia indica* ssp. *leiostachya.*

Arthrocnemum lylei (Ewart & White) J. Black. See *Halosarcia lylei.*

***Asparagus scandens** Thunb., Prodr. Pl. Capens. 66 (1794). Liliaceae. N54, Selby, 30.iv.1979, *A. Morton & D. Parkes* (MEL 595974). Also P35.

Asplenium bulbiferum G. Forst. × **A. terrestre** Brownsey. Aspleniaceae. Recorded for Victoria by Brownsey *(Muelleria* 5: 220 (1983)). Grid D17.

Asplenium flaccidum G. Forst. × **A. obtusatum** G. Forst. Aspleniaceae. Recorded for Victorian by Brownsey, loc. cit. Grid O.

Asplenium terrestre Brownsey, *New Zealand J. Bot.* 15: 71 (1977). Aspleniaceae. Brownsey records this species for Victoria *(Muelleria* 5: 219-220 (1983)). Grids DS.

Banksia integrifolia L.f. var. **integrifolia.** Teste George, *Nuytsia* 3: 280-284 (1981), the only variety of this taxon present in Victoria. NPTXWZ.

Banksia saxicola A.S. George, op. cit. 297. Proteaceae. Formerly included in *B. integrifolia.* Grampians & Wilson's Promontory. DJO.

Banksia spinulosa Sm. var. **cunninghamii** A.S. George, op. cit. 396. This is the only variety of this species present in Victoria (George, op. cit. 392-397).

Banksia collina R. Br. is the basionym of *B. spinulosa* var. *collina* (R. Br.) A.S. George, a variety not found in Victoria.

Barbarea australis J.D. Hook. Delete from flora of Victoria. Hewson, Fl. Australia 8: 319 (1982), states that this taxon is endemic in Tasmania.

Barbarea grayii Hewson, Fl. Australia 8: 390 (1982). Cruciferae. Endemic in the Alps of Victoria and N.S.W. ?V48.

Baumea arthrophylla (Nees) Boeckler, *Linnaea* 38: 242 (1874). Cyperaceae. E8, 3.5 km WNW. of Hawkesdale P.O., 12.xii.1979, A.C. Beauglehole ACB 67260 (MEL, NSW, HO).

Bergia trimera Fischer & Meyer, *Linnaea* 10: 74 (1835). Elatinaceae. A17, 13.i.1982, King's Billabong State Game Refuge, 6.5 km NE. of Red Cliffs, *J.H. Browne JHB 79* (MEL 601289).

Blakeochloa Veldk. Gramineae. For validation of this genus see *Taxon* 30: 477-478 (1981).

Blechnum vulcanicum (Blume) Kuhn in Miq., *Ann. Mus. Bot. Lugduno-Batavum* 4: 284 (1869). Blechnaceae. S17, (MEL). See Walsh, *Victorian Naturalist* 98: 144-145 (1981).

Blennospora drummondii A. Gray in *Hooker's J. Bot. Kew Gard. Misc.* 3: 172 (1851). Synonym: *Calocephalus drummondii* (A. Gray) Benth. teste P. Short, *Muelleria* 4: 401 (1981).

Bolboschoenus caldwellii (V. Cook) Sojak, *Cas. Nar. Mus., Odd. Prir.* 141: 62 (1972). Basionym: *Scirpus caldwellii* V. Cook, *Trans. & Proc. Roy. Soc. New Zealand* 76: 568, t. 56, fig. 3 (1947). Cyperaceae. In Victoria, teste Wilson, *Telopea* 2: 157 (1981). W45, W of Snowy River Mouth, 10.xii.1970, *A.C. Beauglehole ACB 35330* (MEL 525416).

Bolboschoenus medianus (V. Cook) Sojak, op. cit. 63. Basionym: *Scirpus medianus* V. Cook, op. cit. 569, t. 56, fig. 2. Synonym: *S. fluviatilis* sensu Willis (1973:226), non (Torr.) A. Gray.

Brachycome scapiformis DC. see *B. spathulata.*

Brachycome spathulata Gaudich. in Freycinet, Voy. Uranie 468 (1826). Synonym: *B. scapiformis* DC. teste Stace, *Austral. J. Bot.* 29: 435 (1981). Ssp. *spathulata* is the subspecies present in Victoria. (?*B. scapiformis* DC. is given as a ?synonym of *B. aculeata* (Labill.) Less by Willis (1973:675)). Note: Stace uses *Brachyscome,* as used by Cassini (1817), not *Brachycome* as corrected by Cassini (1825).

Bromus catharticus Vahl, Symb. Bot. 2: 22 (1790). Synonyms: *B. unioloides* Kunth; *B. willdenowii* Kunth teste Simon, *Austral. Syst. Bot. Soc. Newsletter* 33: 12-13 (1982), who summarizes the work of Pinto-Escobar, *Caldasia* 11 (54): 9-16 (1976) and *Bot. Jarhb. Syst.* 102: 447-449 (1981).

Bromus unioloides Kunth. See *B. catharticus.*

Bromus willdenowii Kunth. See *B. catharticus.*

Calocephalus drummondii (A. Gray) Benth. See *Blennospora drummondii.*

Capparis mitchellii Lindley in Mitchell, Exped. E. Austral. 1: 311 (1838). Capparaceae. No

Victorian specimen at MEL, though stated to be in all Australian mainland states by Hewson, Fl. Australia 8: 217-218 & map 241 (1982).

?**Cardamine debilis** Banks ex DC. See *C. gunnii* Hewson.

***Cardamine flexuosa** With., Bot. Arr. Brit. Pl., ed. 3, 3: 578 (1796). Cruciferae (Brassicaceae). Hewson, Fl. Australia 8:312 (1982), records this species for Victoria. N44, Warrandyte, 12.ix.1978, P.K. Gullan, V.B. Turner & N.G. Walsh *435* (MEL).

Cardamine gunnii Hewson, op. cit. 390 Synonym: *C. heterophylla* Hook. (1835), non Host (1797), which was given by Willis (1973:181) a a synonym of ?*C. debilis* Banks ex DC.. Hewson, op. cit. 315, lists 2 variants which require further study.

Cardamine lilacina Hook., *Companion Bot. Mag.* 1: 273 (1835). Cruciferae (Brassicaceae). Hewson, Fl. Australia 8: 315-317 (1982), gives details of 4 variants all of which are present in the Great Dividing Range of Victoria, within grids NRSVZ. Hewson calls the variants 1) type variant, 2) 'intermedia' variant, 3) robust alpine snow-patch variant and 4) slender sub-alpine variant.

Cardamine paucijuga Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 27(2): 295 (1854). Cruciferae (Brassicaceae). Hewson, Fl. Australia 8: 314 & map 368 (1982) records this species for western and central Victoria including Wilson's Promontory.

Cassinia laevis R. Br., *Trans. Linn. Soc.* 12: 128 (1818). Synonym: *Cassinia aculeata* (Labill.) R. Br. var. *laevis* (R. Br.) J. Black, *Trans. & Proc. Roy. Soc. S. Austral.* 42: 57 (1918). Compositae. B17, Bronzewing Fauna & Flora Reserve, c. 20 km S. of Ouyen, 16.vi.1980, *N. Macfarlane JMN 1362* (MEL 95097).

Cassytha phaeolasia (F. Muell.) Benth. A synonym of *C. pubescens* R. Br. teste Weber, *J. Adelaide Bot. Gard.* 3: 221 (1981).

Cassytha pubescens R. Br. Includes *C. phaeolasia* (F. Muell.) Benth, teste Weber, loc. cit.

Casuarina littoralis Salisb. See *Allocasuarina littoralis* (Salisb.) L. Johnson.

Casuarina luehmannii R. Baker. See *Allocasuarina luehmannii* (R. Baker) L. Johnson.

Casuarina monilifera L. Johnson. See *Allocasuarina monilifera* (L. Johnson) L. Johnson.

Casuarina muelleriana Miq. See *Allocasuarina muelleriana* (Miq.) L. Johnson.

Casuarina nana Sieber ex Sprengel. See *Allocasuarina nana* (Sieber ex Sprengel) L. Johnson.

Casuarina obesa Miq. in Lehm., Pl. Preiss. 1: 643 (1845). Casuarinaceae. A 26, western edge of bed of Karadoc Swamp, SE. of Mildura, 12.vi.1981, *W.J. Lewis* (MEL 598261).

Casuarina paludosa Sieber ex Sprengel. See *Allocasuarina paludosa* (Sieber ex Sprengel). L. Johnson.

Casuarina paludosa var. **robusta** Macklin. See *Allocasuarina robusta* (Macklin) L. Johnson.

Casuarina paradoxa Macklin, *Kew Bull.* 1931: 150 (1931). See *Allocasuarina paradoxa* (Macklin) L. Johnson. Includes most specimens determined by L. Johnson as *"C. pusilla* ssp. *robusta"*.

Casuarina pusilla (Macklin) L. Johnson. See *Allocasuarina pusilla* (Macklin) L. Johnson, *A. paradoxa* (Macklin) L. Johnson and *A. robusta* (Macklin) L. Johnson. Johnson states that distinctions between these species will be given by Johnson & Wilson in Fl. S. Austral, edn 3, Part 2 (in production).

***Catapodium marinum** (L.) C.E. Hubb., *Kew Bull.* 1954: 375 (1954). Gramineae. P13, Point Nepean, c. 5km WNW. of Portsea, i.1978, P. Smith (MEL).

***Chasmanthe floribunda** (Salisb). N.E. Br., *Trans. Roy. Soc. South Africa* 20: 274 (1932). Synonym: *Pentamenes aethiopica* sensu Willis (1970:342), non (L.) E. Phillips.

Centaurea australe (Cass.) J.D. Hook. See *Rhaponticum australe.*

Cheilanthes austrotenuifolia H. Quirk & T.C. Chambers, *Austral. J. Bot.* 31: 510-513 (1983). Synonym: *C. tenuifolia* var. *tenuifolia* sensu Willis (1970:27), non (Burman f.) Swartz. Widespread in Victoria.

Cheilanthes sieberi Kunze ssp. **sieberi.** Synonym: *C. tenuifolia* Sw. var. *sieberi* (Kunze) J.D. Hook. teste Quirk, Chambers & Regan, *Austral. J. Bot.* 31: 517-521 (1983).

Cheilanthes tenuifolia Sw. var. **sieberi** (Kunze) J.D. Hook. See *C. sieberi* ssp. *sieberi.*

Cheilanthes tenuifolia var. **tenuifolia** sensu J.H. Willis, non (Burman f.) Swartz. See *C. austrotenuifolia* H. Quirk & T.C. Chambers.

***Chenopodium ambrosioide**s L. ?Delete from Victorian flora. Paul G. Wilson, *Nuytsia* 4: 167 (1983), in his revision of *Chenopodium* in Australia, states that he has not seen any Victorian specimens of this species.

Chenopodium anidophyllum Aellen. See *C. desertorum* ssp. *anidophyllum.*

Chenopodium atriplicinum (F. Muell.) F. Muell. See *Scleroblitum atriplicinum* (F. Muell.) Ulbr.

Chenopodium curvispicatum Paul G. Wilson, *Nuytsia* 4: 159-160 (1983). Chenopodiaceae. ABFG.

Chenopodium desertorum (J. Black) J. Black ssp. **anidophyllum** (Aellen) Paul G. Wilson, op. cit. 155-157. Teste Wilson, loc. cit., this taxon does not occur in Victoria. Its basionym, *C. anidophyllum* Aellen, was given as a possible synonym of *C. desertorum* (J. Black) J. Black by Willis (1973:87).

Chenopodium desertorum (J. Black) J. Black ssp. **desertorum.** This subspecies occurs in Victoria, teste Wilson, op. cit. 153. ABFG.

Chenopodium desertorum (J. Black) J. Black ssp. **microphyllum** Paul G. Wilson, op. cit. 154. Basionym: *C. microphyllum* F. Muell. (1858), non Thumb. (1794). Synonym: *C. pseudomicrophyllum* Aellen. BCFGHLMNV.

Chenopodium desertorum (J. Black) J. Black ssp. **rectum** Paul G. Wilson, op. cit. 158. AG.

Chenopodium desertorum (J. Black) J. Black ssp. **virosum** Paul G. Wilson, op. cit. 157-158. Distr.: south-central N.S.W. and possibly central Victoria (Daylesford (?) 1878, *R. Wallace 182* (MEL)). Until further Victorian collections are made its presence in Victoria must remain in doubt.

Chenopodium erosum R. Br., Prodr. 407 (1810). Synonym: *C.* sp. aff. *suecicum* J. Murr. as given by Willis (1973:86).

Chenopodium glaucum L. ssp. **ambiguum** (R. Br.) Murr. & Thellung ex Thellung. Wilson, op. cit. 142, states that he considers it unprofitable to attempt to distinguish by name any of the numerous variants of *C. glaucum* L. which are found in Australia.

Chenopodium pseudomicrophyllum Aellen. See *C. desertorum* ssp. *microphyllum.*

Chenopodium sp. aff. **suecicum** J. Murr. See *C. erosum* R. Br.

Chenopodium trigonon Roemer et Schultes. See *Einadia trigonos.*

Chenopodium ulicinum Gandoger. See *Rhagodia ulicina.*

Chionochloa pallida (R. Br.) S.W.L. Jacobs, *Taxon* 31: 742 (1982). Basionym: *Danthonia pallida.*

Chrysocoryne drummondii A. Gray, in *Hooker's J. Bot. Kew Gard. Misc.* 3: 152 (1851). Synonym: *Angianthus tenellus* (F. Muell.) Benth. teste Short, *Muelleria* 5: 193-196 (1983).

Chrysocoryne pusilla (Benth.) Endl., *Bot. Zeitung (Berlin)* 1: 458 (1843). Synonym: *Angianthus pusillus* (Benth.) Benth. teste Short, *Muelleria* 5: 187, 189-192 (1983).

***Conyza albida** Willd. ex Sprengel, Syst 3: 514 (1825-28). Synonym: *C. floribunda* auct. austr., non Kunth. teste P.W. Michael, *Proc. 6th Asian-Pacific Weed Science Society Conference,* Jakarta, Indonesia 1977, 1: 91-92 (1978) and pers. comm.

***Conyza bilbaoana** Remy in C. Gay, Fl. Chil. 4: 76 (1849). Compositae. V53, Suggan Buggan, upper reaches of Rhymer Creek, 20.viii.1970, *A.C. Beauglehole & K.C. Rogers ACB 33783* (MEL 1504677). Also DENPSW.

***Conyza floribunda** auct. austr., non Kunth. See *C. albida.*

***Conyza parva** Cronquist, *Bull. Torrey Bot. Club* 70: 632 (1943). Compositae. W50, east end of the Lakes National Park, 4.iv.1971, *A.C. Beauglehole ACB 55430* (MEL 1504684). Also DN.

Corybas despectans D. Jones & R. Nash, *Muelleria* 3: 165-168 (1976). Orchidaceae. E12, Bridgewater Lakes, 14.vii.1983, *C.E. Woolcock* (MEL 651898).

***Cotoneaster glaucophyllus** Franchet, P1. Delavay 222 (1890). Rosaceae. V38, 3.7 km N. of Bogong township, 6.iii.1981, *R.J. Adair 1130* (MEL).

***Crassula alata** (Viv.) Berger, *Pflanzenfam.* edn 2, 18a: 389 (1930) ssp. **alata.** Synonym: *C. tripartita* Wakef. teste Toelken, *J. Adelaide Bot. Gard.* 3: 82 (1981).

Crassula colorata (Nees) Ostenf. var. **tuberculata** Toelken, op. cit. 81. Crassulaceae. Widespread in Victoria. *C. colorata* var. *colorata* is also in the western part of Victoria.

Crassula decumbens Thunb. Prodr. 54 (1794) var. **decumbens.** Synonym: *C. macrantha* (J.D. Hook.) Diels & Pritzel teste Toelken, *J. Adelaide Bot. Gard.* 3: 73 (1981).

Crassula macrantha (J.D. Hook.) Diels & Pritzel. See *C. decumbens* Thunb. var. *decumbens.*

*Crassula natans Thunb., Prodr. 54 (1794) var. **minus** (Ecklon & Zeyher), Rowley *Cact. Succ. J. Gt. Brit.* 40: 53 (1978). Crassulaceae. Toelken, *J. Adelaide Bot. Gard.* 3: 69-70 (1981) records this taxon for Victoria. DEJ.

Crassula sieberiana (Schultes & Schultes f.) Druce ssp. **tetramera** Toelken, op. cit. 77. Crassulaceae. Toelken records both ssp. *tetramera* and ssp. *sieberiana* as widespread in Victoria.

Crassula tripartita Wakef. See **C. alata* ssp. *alata*.

Cyathea australis (R. Br.) Domin. Basionym: *Alsophila australis* R. Br. Synonym; *C. leichhardtiana* (F. Muell.) Copel.. Holttum & Kramer, *Flor. Males.,* ser. 2, *Pteridophyta* 1 (5): 562 (1981), retain this species in the genus *Cyathea* together with most other species of *Cyathea* which Tryon, *Contr. Gray Herb.* 200: 1-53 (1970), separated into distinct genera. Holttum & Kramer agree that the genus *Sphaeropteris* may demand recognition (Victorian representative *S. australis* (Presl.) Tryon).

Cyathea cunninghamii J.D. Hook. Synonym: *Alsophila cunninghamii* (J.D. Hook). Tryon. See note under *C. australis*.

Cyathea marcescens Wakef. Synonym: *Alsophila marcescens* (Wakef.) Tryon. See note under *C. australis*.

Cycloloma atriplicifolium (Sprengel) J. Coulter, *Mem. Torrey Bot. Club 5:* 143 (1894). Chenopodiaceae. Mentioned by Willis (1973:89) as having occurred at Walpeup & Ouyen. Now known to be established at Ouyen (D. Foreman, pers. comm. June 1984). (MEL). B.

Cyphanthera albicans (A. Cunn.) Miers, *Ann. Mag. Nat. Hist.* ser. 2, 11: 379 (1853) ssp. **albicans.** Basionym: *Anthocercis albicans* A. Cunn.. Teste Haegi, *Telopea* 2: 176 (1981), this is the only subspecies present in Victoria. *Fl. Australia* 29: 24 (1982) notes that it has not been collected in Victoria recently.

Cyphanthera anthocercidea (F. Muell.) Haegi, *Telopea* 2: 176 (1981). Synonym: *Anthocercis frondosa* sensu Willis (1973:558).

Cyphanthera myosotidea (F. Muell.) Haegi, op. cit. 177. Basionym: *Anthocercis myosotidea* F. Muell.

Danthonia Lam. & DC. For further discussion as to the name which should ultimately be used for most of the Australian and New Zealand species see Connor & Edgar, Argument against rejection of *Plinthanthesis* Steud. (Poaceae) (Prop. 520), in *Taxon* 30: 657-658 (1981).

Danthonia pallida R. Br. See *Chionochloa pallida*.

Daviesia benthamii Meissner in Lehm., Pl. Preiss. 1: 48 (1844) ssp. **humilis** M. Crisp, *J. Adelaide Bot. Gard.* 6: 60-63 (1982). Included by Willis (1973:259) in *D. genistifolia* Benth. Papilionaceae. M29, Whipstick Mallee Scrub 18 miles (29 km) NNE. of Bendigo, 23.x.1964, *E.F. Constable 5231* (K, NSW). Also C. Crisp's map, l.c. 62, does not show *D. genistifolia* in the western half of Victoria.

Dichelachne micrantha (Cav.) Domin, Biblioth. Bot. 20 (Heft 85): 353 (1915). Synonym: *D. sciurea* (R. Br.) J.D. Hook. See Veldkamp, *Blumea* 22: 9 (1974).

(*) **Digitaria ciliaris** (Retz.) Koeler, Descr. Gram. 27 (1802). Gramineae. Victoria (with no further details) is included in the distribution of this species by Webster, *Brunonia* 6: 171 (1983). The only specimen at MEL determined by Webster is from Hawkesdale (cult.), 1903, *H.B. Williamson.*

Digitaria coenicola (F. Muell.) Hughes, *Kew Bull. Misc. Inform.* 1923: 313 (1923). Gramineae. See Webster, *Brunonia* 6: 173 (1983). (MEL). CL.

Digitaria diffusa Vick. ?Delete. Recorded by Willis (1970: 198, 424) at Walwa (grid U50) but Webster, *Brunonia* 6:177 (1983), in his revision of Australian *Digitaria,* does not record this species for Victoria and MEL holds no Victorian specimen of it.

Digitaria divaricatissima (R. Br.) Hughes. Webster, op. cit. 179 records this species for Victoria but MEL holds no Victorian specimen identified by him. Victorian material at MEL previously determined as this species has been redetermined by Webster as *D. coenicola* (F. Muell.) Hughes.

Digitaria hystrichoides Vick. Delete. Willis's view (1970:198) that this species is not present for Victoria is confirmed by Webster, *Brunonia* 6: 184 (1983). MEL holds no Victorian specimen.

Diplachne fusca (L.) P. Beauv. ex Roemer & Schultes, Syst. Veg. ed. 5, 2: 615 (1817) — this is the correct citation. Synonym: *D. reptatrix* (L.) Druce teste B.K. Simon, *Australian Syst. Bot. Soc. Newsletter* 32: 10-12 (1982).

Diplachne muelleri Benth., Fl. Austral. 7: 619 (1878). Gramineae. G45, 26.iv.1977, *A.C. Beauglehole ACB 55705* (MEL 1511121).

Diplachne reptatrix (L.) Druce. See *D. fusca.*

Drapetes tasmanicus J.D. Hook. in *Hooker's J. Bot. Kew Gard. Misc.* 5: 299-300, t. 7 (1853). Thymelaeaceae. V47, Bogong High Plains, i.1980, *R. Adair 893* (MEL 577528). On side of seasonally inundated depression.

Drosera auriculata Backh. ex Planchon. Marchant & George in Fl. Australia 8: 24 (1982) retain the specific status of this taxon. Synonym: *D. peltata* Thunb. ssp. *auriculata* (Backh. ex Planchon) Conn.

Drosera indica L., Sp. Pl. 1: 282 (1753). Droseraceae. A45, Hattah Lakes National Park, 14.xii.1981, T. Mitchell (MEL 595758). Close to water after flood recession.

Drosera macrantha Endl., Enum. Pl. 6 (1837). Synonym: *D. planchonii* J.D. Hook. ex Planchon. Conn, *Muelleria* 5: 347-349 (1984), rejects the subspecific classification (ssp. *macrantha* and ssp. *planchonii* (J.D. Hook. ex Planchon) Marchant, Flora Australia 8: 383 (1982)) of *D. macrantha* accepted by Marchant, loc. cit., because the two subspecies are morphologically indistinguishable.

Drosera macrantha Endl. ssp. **planchonii** (J.D. Hook. ex Planchon) Marchant. See *D. macrantha.*

Drosera peltata. The correct authority for this name is Thunberg, Diss. 2: 295 (1797) (see Conn, *J. Adelaide Bot. Gard.* 3: 91, 95-96 (1981)).

Drosera peltata ssp. **auriculata** (Backh. ex Planchon) Conn., op. cit., 98. See *D. auriculata.*

Drosera planchonii J.D. Hook. ex Planchon. See *D. macrantha.*

Drosera spathulata Labill. See *D. spatulata.*

Drosera spatulata Labill., Nov. Holl. Pl. 1: 79, t. 106 fig. 1 (1805). This is the original spelling of this name and it is spelt thus by Marchant & George, Fl. Australia 8: 19 (1982).

Dysphania glomulifera (Nees) Paul G. Wilson, *Nuytsia* 4: 183-186 (1983) ssp. **glomulifera.** Synonym: *D. myriocephala* Benth. This is the only subspecies present in Victoria. Wilson (op. cit. 185) states that two variants of it are found in Victoria near the Murray River. In one the pericarp is smooth and in the other it is papillate but there do not appear to be other morphological characters which might support the recognition of these variants as distinct taxa.

Dysphania myriocephala Benth. See *D. glomulifera* ssp. *glomulifera.*

Ehrharta distichophylla Labill. Synonym: *Tetrarrhena distichophylla* (Labill.) R. Br. teste Willemse, *Blumea* 28: 185 (1982). Willemse includes the genus *Tetrarrhena* R. Br. in the genus *Ehrharta* and cites J.H. Willis, Handb. Pl. Victoria. 1: 90 (1962), as a reference for the genus *Tetrarrhena.* He was making special reference to the Malesian taxa and therefore did not make the new combinations under *Ehrharta* that will be needed for *T. acuminata* R. Br. and *T. juncea* R. Br.

Ehrharta stipoides Labill. var. **stipoides.** Synonym: *Microleana stipoides* (Labill.) R. Br., teste Willemse, *Blumea* 28: 190 (1982).

Einadia hastata (R. Br.) A.J. Scott, *Feddes Repert.* 89 (Heft 1): 3 (1978). Wilson, *Nuytsia* 4: 211 (1983), accepts this name. Basionym: *Rhagodia hastata* R. Br.

Einadia trigonos (Roemer & Schultes) Paul G. Wilson, op. cit. 206, ssp. **trigonos.** Basionym: *Chenopodium trigonon* Roemer & Schultes, Syst. Veg. 6: 275 (1820). This is the only subspecies present in Victoria.

Eleocharis plana S.T. Blake, *Proc. Roy. Soc. Queensland* 49: 155 (1938). Cyperaceae. V11, Lake Hume, just E of old Tallangatta, 22.i.1981, N.H. Scarlett 81-21 (MEL 584360).

Elymus elongatus (Host) Runem. See *Agropyron elongatum.*

Epacris coriacea Cunn. ex DC., Prodr. 7: 763 (1839). Epacridaceae. S17, Caledonia Swamp, 21 km NNW. of Mt. Wellington, 31.i.1982, *E.A. Chesterfield* (MEL 602115). Collected there on 6.i.1973 by *Chesterfield & A.C. Beauglehole ACB 40996.* Also VW.

***Erophila verna** (L.) Chevall. Teste Hewson, Fl. Australia 8: 310 (1982), ssp. *verna* and

ssp. *praecox* (Steven) Walters, *Feddes. Repert. Spec. Nov. Regni Veg.* 69: 57 (1964), are both present in moist regions of Victoria.

***Eruca sativa** Miller, Gard. Dict. ed. 8 (1768). Hewson, Fl. Australia 8: 246 (1982), retains this taxon as a species. Synonym: **E. vesicaria* ssp. *sativa* (Miller) Thell.

***Eruca vesicaria** (L.) Cav. ssp. **sativa** (Miller) Thell. See **E sativa.*

Eucalyptus brookeriana A.M. Gray, *Austral. Forest Res.* 9: 111 (1979). Myrtaceae. Recorded for Victoria by Ladiges, Gray & Brooker, *Austral. J. Bot.* 29: 593-603 (1981), expecially p. 596 — "two divergent groups, one from Otway Ranges (Vic.) and King Id, and one from Central Highlands, Vic. and Tasmania", MEL holds specimens from grids JN.

Eucalyptus nitida sensu J.H. Willis (1973:415-416), non J.D. Hook. See *E. willisii.*

Eucalyptus pauciflora Sieber ex Sprengel × **E. radiata** Sieber ex DC. hybrids. Myrtaceae. See Whiffin, *Bot. J. Linn. Soc.* 83: 237-250 (1981). Distr.: N ?38, Brisbane Ranges near Durdidwarrah.

?Eucalyptus regnans F. Muell. × **E. obliqua** L'Her. hybridizing with *E. macrorhyncha* F. Muell. ex Benth. Myrtaceae. See Yorke & Ashton, A possible tri-hybrid eucalypt, *Victorian Naturalist* 99: 209-213 (1982). S.

Eucalyptus viminalis Labill. ssp. **cygnetensis** Boomsma, *J. Adelaide Bot. Gard.* 2: 295 (1980). Myrtaceae. C32, 25 km S. of Kiata, Little Desert, 24.v.1979, *G.C. Cornwall 323* (S. Austral. Woods & Forests Dept.).

Eucalyptus willisii Ladiges, Humphries & Brooker, *Austral. J. Bot.* 31: 583-584 (1983). Synonym: *E. nitida* sensu J.H. Willis (1973:415-416), non J.D. Hook.

Eugenia smithii Poiret. See *Acemena smithii.*

Euphrasia alsa F. Muell. Delete from Victorian flora. Synonym: *E. scabra* R. Br. var. *alsa* (F. Muell.) J.H. Willis pro parte. Barker, *J. Adelaide Bot. Gard.* 5: 256 (1982) reinstates this taxon at species level. Endemic in N.S.W. For Victorian material formerly under this name see *E. eichleri.*

Euphrasia caudata (J.H. Willis) Barker, op. cit. 265. Basionym: *E. scabra* var. *caudata* J.H. Willis.

Euphrasia collina R. Br. ssp. **collina.** Teste Barker, op. cit. 159-236, ssp. *collina* and the following 6 subspecies have been found in Victoria. Ssp. *collina* distribution includes some glabrous forms in CEGHJKMNPSTWXZ.

Euphrasia collina ssp. **diversicolor** W.R. Barker, op. cit. 223. One doubtful locality for Victoria. ?V, Mt. Hotham (Mueller's Mt. Hotham is now Mt. Feathertop), s. dat., *Mueller s.n.,* (MEL 41549).

Euphrasia collina aff. ssp. **diversicolor** W.R. Barker, op. cit. 229. Synonym: *E. glacialis* sensu Willis (1973:573), non Wettst.

Euphrasia collina ssp. **muelleri** (Wettst). W.R. Barker, op. cit. 209. Once widely distributed on mainland Australia in lowlands and low mountain habitats but now ? extinct. Barker states that Victorian occurrences probably included grids CDHJMNQRSUV.

Euphrasia collina ssp. **paludosa** W.R. Barker, op. cit. 204. Mainly montane and sub-alpine regions. JKNPRSTVWZ.

Euphrasia collina ssp. **paludosa** (R. Br.) W.R. Barker × **E. lasianthera** W.R. Barker. Hybrid reported by Barker, op. cit. 288. S17.

Euphrasia collina ssp. **speciosa** (R. Br.) W.R. Barker, op. cit. 215. Synonym: includes *"E.* sp.", Burbidge & Gray, Flora A.C.T. (1970:328). Several old Victorian collections between Ballarat and Heathcote.

Euphrasia collina ssp. **tetragona** (R. Br.) W.R. Barker, op. cit. 189. Barker (op. cit. 196) states that this widespread subspecies is in western Victoria.

Euphrasia collina ssp. **trichocalycina** (Gand.) W.R. Barker, op. cit. 196. CDHJMN.

Euphrasia crassiuscula Gand., *Bull. Soc. Bot. France* 66: 218 (1919). Barker, *J. Adelaide Bot. Gard.* 5: 236-247 (1982), divides the material that Willis, *Muelleria* 1: 146 (1967), cited with the original description of *E. glacialis* var. *eglandulosa* J.H. Willis into 3 subspecies of *E. crassiuscula* Gand. These are 1) ssp. **crassiuscula.** See Barker, op. cit. 241. RV; 2) ssp. **eglandulosa** (Willis) W.R. Barker, op. cit. 245. Basionym: *E. glacialis* var. *eglandulosa* J.H. Willis sensu stricto. V; 3) ssp. **glandulifera** W.R. Barker, op. cit. 242. V.

Euphrasia eichleri W.R. Barker, op. cit. 254. Synonym: *E. scabra* var. *alsa* auct., non F. Muell., including Willis (1973:573). VW.

Euphrasia gibbsiae forma **comberi** auct., incl. Willis (1973:573), non Du Rietz. See *E. lasianthera* W.R. Barker.

Euphrasia gibbsiae Du Rietz forma **subglabrifolia** Du Rietz. See *E. gibbsiae* ssp. *subglabrifolia* (Du Rietz) W.R. Barker.

Euphrasia gibbsiae Du Rietz ssp. **subglabrifolia** (Du Rietz) W.R. Barker, *J. Adelaide Bot. Gard.* 5: 127 (1982). Basionym: *E. gibbsiae* forma *subglabrifolia* Du Rietz.

Euphrasia glacialis sensu J.H. Willis (1973:573) (excluding *E. glacialis* var. *eglandulosa* J.H. Willis). See *E. collina* aff. ssp. *diversicolor.*

Euphrasia glacialis Wettst. var. **eglandulosa** J.H. Willis. See *E. crassiuscula.*

Euphrasia lasianthera W.R. Barker, *J. Adelaide Bot. Gard.* 5: 250 (1982). Synonym: *E. gibbsiae* forma *comberi* auct., incl. Willis (1973:573), non Du Rietz.

Euphrasia scabra R. Br. var. **alsa** (F. Muell.) J.H. Willis. For Victorian specimens see *E. eichleri* W.R. Barker. See also *E. alsa* (deleted from Victoria).

Euphrasia scabra var. **caudata** J.H. Willis. See *E. caudata.*

***Euryops abrotanifolius** (L.) DC., Prodr. 6: 443 (1838). Compositae. N54, Dandenong Ranges, Montrose, 17.viii.1975, *G.W. Carr 6163* (MEl 573083). Also P.

Frankenia gracilis Summerh., *J. Linn. Soc., Bot.* 48: 380 (1930), is listed by Barnsley, Flora Australia 8: 140 (1982), as occurring in north-west Victoria. Frankeniaceae. A17, Mildura, Sandalong Park, 10.xi.1980, *J.H. Browne* (MEL 95667). Also B.

Frankenia sessilis Summerh.. The only variety found in Victoria is var. *sessilis* (see Flora Australia 8: 118 (1982)).

***Freesia** hybrids including **F. refracta* sensu J.H. Willis (1970:341), non (N.J. Jacq.) Klatt. There is no name at present for the entities naturalized in Australia. Some appear referable to *F. leichtlinii* Klatt and *F. alba* (G.L. Meyer) Gumbleton, others are intermediate between these species (D. Cooke, pers. comm.). Goldblatt, *J. South African Bot.* 48: 39-91 (1982), has recently revised the genus *Freesia* Klatt and has examined some Victorian specimens.

***Freesia refracta** sensu J.H. Willis (1970:341), non (N.J. Jacq.) Klatt. See *Freesia* hybrids.

Galium ciliare J.D. Hook. See Ehrend. & McGillivray, *Telopea* 2: 366-367 (1983), also previous notes in Todd (1979:177).

Galium compactum Ehrend. & McGillivray, *Telopea* 2: 370 (1983). Rubiaceae. Distribution includes Victoria. EKP.

Galium curvihirtum Ehrend. & McGillivray, op. cit. 373. Rubiaceae. Distribution includes Victoria. CEJ.

***Galium divaricatum** Pourret ex Lam., Encycl. 2: 580 (1788). Synonym: *G. parisiense* var. *australe* Ewart & J. White teste Ehrend. & McGillivray, *Telopea* 2: 376 (1983).

Galium migrans Ehrend. & McGillivray, op. cit. 362-364. Rubiaceae. NSVW and T and/or O (for Wilson's Promontory).

Galium parisiense var. **australe** Ewart & J. White. See ***G. divaricatum.***

Gamochaeta purpurea (L.) Cabrera. See *Gnaphalium purpureum.*

***Gnaphalium americanum** Miller, Gard. Dict. edn 8, n. 17 (1768). Compositae. M29, Bendigo district, Whipstick Scrub, 25.xi.1962, *Perry* (MEL 661401). Also W.

***Gnaphalium calviceps** Fernald, *Rhodora* 37: 449, t. 405 (1935) (sphalm. *calvescens* on p. 449). Compositae. V6, Mt Mitta Mitta, NW. of Corryong, c. 3,000 ft alt. 9.xii.1974. *J.H. Willis* (MEL 661402). STVW.

Gnaphalium candidissimum** Lam. See ***Vellereophyton dealbatum.

Gnaphalium coarctatum Willd., Sp. Pl. edn 5, 3 (1886). Synonym: *G. spicatum* Lam. (1788), non Mill. (1768), teste Hilliard & Burtt, *J. Linn. Soc. Bot.* 82: 248 (1981).

Gnaphalium luteo-album L. See *Pseudognaphalium luteo-album.*

Gnaphalium purpureum L. Synonym: *Gamochaeta purpurea* (L.) Cabrera. Hilliard & Burtt, *J. Linn. Soc. Bot.* 82: 246 (1981) retain this species in *Gnaphalium.*

Gnaphalium spicatum Lam. See *G. coarctatum* Willd.

Gnephosis burkittii Benth., Fl. Austral. 3: 570 (1867). Synonym: *Angianthus burkitti* (Benth.) J. Black. Teste Short, *Muelleria* 5: 209-210 (1983), the affinities of this species are uncertain. He retains it in the genus *Gnephosis.*

Grevillea floripendula R.V. Smith, *Muelleria* 4: 423 (1981). Proteaceae. Known only from an area north of Beaufort. Grid J. W.M. Molyneux, *Muelleria* 3: 144-145 (1975), referred to this taxon but did not name it.

Grevillea montis-cole R.V. Smith ssp. **montis-cole**, *Muelleria* 5: 223-226 (1983). Known only from Mt Cole State Forest, north of Beaufort, J14.

Grevillea montis-cole R.V. Smith ssp. **brevistyla** R.V. Smith, op. cit. 223-226. Known only from Mt Langhi Ghiran, J14.

Halophila decipiens Ostenf., *Bot. Tidsskr.* 24:260 (1902). Hydrocharitaceae. Z26, Mallacoota Inlet, Gypsy Point, 10.xi.1980, McConchie & Macauley, (MEL 584594). Z.

Halosarcia flabelliformis Paul G. Wilson, *Nuytsia* 3:52 (1980). Chenopodiaceae. A33, NW Raak Plains, 9.v.1981, *J.H. Browne 29* (MEL).

Halosarcia halocnemoides (Nees) Paul G. Wilson, op. cit. 31-32 ssp. **halocnemoides.** Basionym: *Arthrocnemum halocnemoides* Nees.

Halosarcia indica (Willd.) Paul G. Wilson ssp. **bidens** (Nees) Paul G. Wilson, op. cit. 67. Chenopodiaceae. AB.

Halosarcia indica (Willd.) Paul G. Wilson ssp. **leiostachya** (Benth.) Paul G. Wilson, op. cit. 66. Synonym: *Arthrocnemum leiostachyum* (Benth.) Paulsen.

Halosarcia lylei (Ewart & J. White) Paul G. Wilson, op. cit. 49. Synonym: *Arthrocnemum lylei* (Ewart & J. White) J. Black.

Halosarcia nitida Paul G. Wilson, op. cit. 38. Chenopodiaceae. A35, Nowingi, 30.xi.1949, *A.M. O'Neill* (MEL 70631).

Halosarcia pergranulata (J. Black) Paul G. Wilson ssp. **divaricata** Paul G. Wilson op. cit. 45. Chenopodiaceae. G35, 17km NW. of Kerang, *Beauglehole ACB 57137* (PERTH).

Halosarcia pergranulata (J. Black) Paul G. Wilson, op. cit. 40 ssp. **pergranulata.** Basionym: *Arthrocnemum halocnemoides* var. *pergranulatum* J. Black. ABCNP.

Halosarcia pruinosa (Paulsen) Paul G. Wilson, op. cit. 54. Chenopodiaceae. AG.

Halosarcia pterygosperma (J. Black) Paul G. Wilson. Basionym: *Arthrocnemum halocnemoides* var. *pterygospermum* J. Black.

Halosarcia syncarpa Paul G. Wilson, op. cit. 56. Chenopodiaceae. C.

Harmsiodoxa brevipes (F. Muell.) O. Schulz var. **brevipes.** Teste Hewson, Flora Australia 8:348-349 (1982), this is the only variety present in Victoria.

Hibbertia cistiflora (Siever ex Sprengel) Wakef. See *H. cistiflora* Wakef.

Hibbertia cistiflora Wakef., Victorian Naturalist 72:119 (1955). Synonym: *Pleurandra cistiflora* Sieber ex Sprengel (1827), non Reich. (1825 & 1827). Teste Hoogland, *Austral. Syst. Bot. Soc. Newsletter* 3 (4): 4 (1983), Wakefield's name should be treated as a *nomen novum* as Sprengel's *Pleurandra cistiflora* is illegitimate, being a later homonym, and Reichenbach's name represents the same species but has a different type.

Hibbertia fasciculata sensu J.H. Willis, non DC. See *H. prostrata.*

Hibbertia prostrata Hook., *J. Bot. (Hooker)* 1:246 (1834). Synonym: *H. fasciculata* sensu J.H. Willis (1973:387), non DC. (see Hoogland, *Austral. Syst. Bot. Soc. Newsletter* 3 (4):3 (1983).

Homeria collina (Thunb.) Salisb., *Trans. Hort. Soc. London* 1: 307 (1812). This is the correct name for the weedy species that has been widely misidentified as *H. breyniana* var *aurantiaca* (i.e. *H. flaccida* Sweet) in Australia (Goldblatt, *Ann. Missouri Bot. Gard.* 68:419 (1981)). *H. flaccida* may also be present in Victoria.

Hybanthus monopetalus (Schultes) Domin. Teste George, Flora Australia 8:104 (1982), this is the correct authority for this name. The basionym, *Ionidium monopetalum,* was described by Schultes alone in Roemer and Schultes, Syst. Veg. 5:400 (1819).

Hybanthus vernonii (F. Muell.) F. Muell. ssp. **vernonii.** Teste George, Flora Australia 8:106 (1982), this is the only subspecies present in Victoria.

Hymenanthera dentata R. Br. ex DC. George, in Flora Australia 8:109 (1982), includes var. *angustifolia* within *H. dentata* without distinguishing it as a variety.

Hymenanthera dentata R. Br. ex DC. var. **angustifolia** (R. Br. ex DC.) Benth. See *H. dentata.*

Irenepharsus magicus Hewson, Flora Australia 8:391, 351 (1982). Cruciferae (Brassicacae.) See also Hewson, *J. Adelaide Bot. Gard.* 6:3 (1982). MEL holds specimens from W13, 14 and 16.

Isolepis alpina J.D. Hook, Fl. Tasman. 2:86 (1858); t 143 (1859) Synonym: *Scirpus gunnii* Boeckler teste Wilson, *Telopea* 2:165 (1981).

Isolepis aucklandica J.D. Hook. Synonym: *Scirpus aucklandicus* (J.D. Hook.) Boeckler teste Wilson, loc. cit.

Isolepis australiensis (Maiden & Betche) K.L. Wilson, loc. cit. Synonym: *Scirpus australiensis* (Maiden & Betche) S.T. Blake.

Isolepis cernua (Vahl) Roemer & Schultes, Syst. Veg. 2:106 (1817). Basionym: *Scirpus congruus* Vahl teste Wilson, *Telopea* 2:166 (1981).

Isolepis congrua Nees in Lehm., Pl. Preiss. 2:75 (1846). Synonym: *Scirpus congruus* (Nees) S.T. Blake teste Wilson, *Telopea* 2:166 (1981).

Isolepis crassiuscula J.D. Hook., Fl. Tasman. 2:86 (1858); t. 143 fig. A (1859) Synonym: *Scirpus crassiusculus* (J.D. Hook.) Benth. teste Wilson, *Telopea* 2: 166 (1981).

Isolepis fluitans (L.) R. Br., Prodr. 221 (1810). Basionym: *Scirpus fluitans* L. teste Wilson, *Telopea* 2:166 (1981).

Isolepis habra (Edgar) Sojak, *Cas. Nar. Mus., Odd. Prir.* 148: 194 (1979). Basionym: *Scirpus habrus* Edgar teste Wilson, *Telopea* 2:166 (1981).

Isolepis hookeriana Boeckler, *Flora* 41 : 418 (1858). Synonyms: *Scirpus hookerianus* (Boeckler) S.T. Blake ; *S. calocarpus* S.T. Blake teste Wilson, *Telopea* 2 : 167 (1981).

***Isolepis hystrix** (Thunb.) Nees, *Linnaea* 7 : 496 (1832). Basionym : *Scirpus hystrix* Thunb. teste Wilson, *Telopea* 2 : 167 (1981).

Isolepis inundata R. Br., Prodr. 222 (1810). Synonym: *Scirpus inundatus* (R.Br.) Poiret teste Wilson, *Telopea* 2: 167 (1981).

Isolepis marginata (Thunb.) A Dietr., Sp. Pl., edn 6, 1 : 110 (1832). Basionym : *Scirpus marginatus* Thunb. *Prodr. Pl. Capens.* 17 (1794). Synonym: *S. antarcticus* auct., incl. J.H. Willis (1970:229), non L., teste Wilson, *Telopea* 2 : 168 (1981).

Isolepis montivaga (S.T. Blake) K.L. Wilson, *Telopea* 2 : 168 (1981). Basionym: *Scirpus montivagus* S.T. Blake.

Isolepis nodosa (Rottb.) R. Br., Prodr. 221 (1810). Basionym: *Scirpus nodosus* Rottb. teste Wilson, *Telopea* 2 : 168 (1981).

Isolepis platycarpa (S.T. Blake) Sojak, *Cas. Nar. Mus, Odd. Prir,* 148 : 194 (1979). Basionym : *Scirpus platycarpus* S.T. Blake teste Wilson, *Telopea* 2 : 168 (1981).

Isolepis producta (C.B. Clarke) K.L. Wilson, *Telopea* 2: 168 (1981). Basionym: *Scirpus productus* C.B. Clarke.

***Isolepis prolifera** (Rottb.) R. Br., Prodr. 223 (1810). Basionym: *Scirpus prolifer* Rottb. teste Wilson, *Telopea* 2 : 169 (1981).

Isolepis stellata (C.B. Clarke) K.L. Wilson, *Telopea* 2 : 169 (1981). Basionym: *Scirpus stellatus* C.B. Clarke.

Isolepis subtilissima Boeckler, *Flora* 41: 416 (1858). Synonyms : *Scirpus subtilissimus* (Boeckler) S.T. Blake; *S. merrillii* (Palla) Kük. ex Merr. teste Wilson, *Telopea* 2 : 169 (1981).

Isolepis victoriensis (Wakef.) K.L. Wilson, *Telopea* 2: 170 (1981). Basionym: *Scirpus victoriensis* Wakef.

Isolepis wakefieldana (S.T. Blake) K.L. Wilson, loc. cit. Basionym: *Scirpus wakefieldiana* S.T. Blake.

Ixodia achillaeoides R. Br. ssp. **achillaeoides** has not been found in Victoria. See other subspecies below.

Ixodia achillaeiodes R. Br. ssp. **alata** (Schldl.) P. Copley *J. Adelaide Bot. Gard.* 6: 48-51 (1982). Distr: Grampians and west coast from mouth of Glenelg River to Anglesea.

Ixodia achillaeoides R. Br. ssp. **arenicola** P. Copley, op. cit. 46-48. Distr.: E (near Portland).

Kippistia suaedifolia F. Muell. Lander & Barry, *Nuytsia* 3 : 215-219 (1980), reinstate the genus *Kippistia* F. Muell. Synonym: *Minuria suaedifolia* (F. Muell.) Benth.

Korthalsella japonica auct., incl. J.H. Willis (1973:69), non (Thunb.) Engler. See *K. rubra.*

Korthalsella rubra (Tieghem) Engler, *Natur. Pfanzenfam. Nachtr.* 138 (1897). Ssp. **rubra** is the subspecies present in Victoria. Synonym: *K. japonica* auct., incl. J.H. Willis (1973:69), non (Thunb.) Engler, teste Barlow, *Brunonia* 6 : 51 (1983).

Kunzea ericoides (A. Rich.) J. Thompson, *Telopea* 2 : 379 (1983). Synonym: *Leptospermum phylicoides* (Cunn. ex Schauer) Cheel.

***Lepidium africanum** (Burman f.) DC. Synonym: *L. hyssopifolium* auct. pro parte, non

Desv.. *L. africanum* is one of three species that Willis (1973:174) included in *L. hyssopifolium*. See Hewson, *Brunonia* 4 : 274, 277-285 (1981).

Lepidium desvauxii sensu J.H. Willis (1973:176), non Thell., is *L. hyssopifolium* Desv., teste Forbes et al. (1984:46 & 129).

Lepidium desvauxii Thell. Synonyms : *L. praetervisum* Domin, *L. halmaturinum* J. Black teste Hewson, *Brunonia* 4:292, 294 (1981).

Lepidium dubium Thell. See *L. hyssopifolium* Desv.

Lepidium halmaturinum J. Black. See *L. desvauxii* Thell.

Lepidium hyssopifolium sensu J.H. Willis (1973:174). Willis included the following three species under this name: **L. africanum* (Burman f.) DC., *L. pseudo-hyssopifolium* Hewson and *L. pseudo-tasmanicum* Thell., teste Hewson *Brunonia* 4 : 274, 277-285 (1981).

Lepidium hyssopifolium Desv. Synonyms : *L. dubium* Thell. and *L. desvauxii* Thell. pro parte, teste Hewson, op. cit. 289.

Lepidium leptopetalum (F. Muell.) F. Muell. The Western Australian material formerly included under this name, e.g. Willis (1973:173), has been described as a separate species — *L. platypetalum* Hewson, *Brunonia* 4 : 247 (1981).

Lepidium phlebopetalum (F. Muell.) F. Muell. Pl. Victoria 1 : 47 (1860-62). Synonym: *L. rotundum* sensu J.H. Willis (1973:173), non (Desv.) DC., teste Hewson, *Brunonia* 4 : 235 (1981).

Lepidium praetervisum Domin. See *L. desvauxii.*

Lepidium pseudo-hyssopifolium Hewson, *Brunonia* 4 : 281 (1981). Synonym: *L. hyssopifolium* auct. pro parte, non Desv. This is one of 3 species that Willis (1973:174) included in *L. hyssopifolium*. CMNRT.

Lepidium pseudo-papillosum Thell. in Schinz., *Vierteljahrsschr. Naturf. Ges. Zurich* 61: 462 (1916). Cruciferae. Hewson, *Brunonia* 4: 272-273 (1981) records this species as rare in the northern plains of Victoria. H.

Lepidium pseudo-tasmanicum Thell., *Neue Denkschr. Allg. Schw. Gesammt. Naturw. Zurich* 41: 307 (1906). Synonym: *L. hyssopifolium* auct. pro parte, non Desv. This is one of 3 species that J.H. Willis (1979:174) included in *L. hyssopifolium*. See Hewson, *Brunonia* 4 : 274, 277-285 esp. 284-285 (1981). CEJNWZ.

Lepidium rotundum sensu J.H. Willis (1973:173), non (Desv.) DC. See *L. phlebopetalum.*

Leptospermum phylicoides (Cunn. ex Schauer) Cheel. See *Kunzea ericoides.*

Lolium temulentum L. var. **arvense** (With.) Lilj. *Utkast. Sv. Fl.* edn 3, 80(1816). Gramineae. Kloot, *Austral. J. Bot.* 31 : 427,t.1g & 432 (1983), records both this variety and var. *temulentum* for Victoria.

Marsilea mutica Mett., *Ann. Sci. Nat.* ser. 4, 15 : 88 (1861). Marsileaceae. Aston, Aquatic Plants of Australia 41 (1973) and ibid, Suppl. 3-4 (1977), records this plant for Victoria. (MEL). NSTW.

Melothria micrantha (F. Muell.) F. Muell. ex Cogn. See *Mukia micrantha.*

Microlaena stipoides (Labill.) R. Br. See *Ehrharta stipoides.*

Minuria suaedifolia (F. Muell.) Benth. See *Kippistia suaedifolia.*

***Monopsis simplex** (L.) F. Wimmer, *Ann. Naturhist. Mus. Wien* 56: 370 (1948). Lobeliaceae. D19, 5 miles W. of Dergholm, 23.xi.1971, *A.C. Beauglehole ACB 37938* (MEL 540758).

Mukia micrantha (F. Muell.) F. Muell., Fragm. 2 : 180, 193 (1861). Synonym: *Melothria micrantha* (F. Muell.) F. Muell. teste Telford, Flora Australia 8:187 (1982).

Myriophyllum caput-medusae Orch., *Brunonia* 4 : 53-54 (1981). Synonym: *M. elatinoides* sensu auct. Austral., incl. Willis (1973:472) pro parte, non Gaudich. Haloragaceae. Widespread in Victoria (see Orchard, op. cit. 57, t.7A map).

Myriophyllum elationoides sensu auct. Austral., incl. Willis (1973:472), non Gaudich. (1825). See *M. caput-medusae, M. porcatum,* and *M. salsugineum.*

Myriophyllum porcatum Orch., *Brunonia* 4 : 59 (1981). Synonym: *M. elatinoides* sensu auct. Aust., incl. Willis (1973:472) pro parte, non Gaudich. (1825). Haloragaceae. Southern Victoria (See Orchard, op. cit. 51, t. 5A map).

***Nasturtium microphyllum** Boenn. ex. Reichb. See **Rorippa microphylla.*

***Nasturtium officinale** R. Br. See **Rorippa nasturtiumaquaticum.*

Notodanthonia Zotov. S.W.L. Jacobs, *Taxon* 31 : 737-743 (1982), has presented a case for rejecting the proposal (520) for conserving *Notodanthonia* Zotov (1963).

Nymphoides geminata (R. Br.) O. Kuntze. This is the correct name for the species given as *Nymphoides* sp. aff. *exiliflora* by Aston, Aquatic Pl. Australia (1973:117). (Aston pers. comm.).

Nymphoides geminata sensu Willis (1973: 525) and Aston, Aquatic Pl. Australia (1973: 111), non (R. Br.) O. Kuntze. See *N. montana.*

Nymphoides montana H. Aston, *Muelleria* 5: 36 (1982). Synonym: *N. geminata* sensu Willis (1973: 525), and Aston, Aquatic Pl. Australia (1973: 111), non (R. Br.) O. Kuntze.

Oenothera striata Ledeb. See *O. stricta.*

Oenothera stricta Ledeb., *Mem. Acad. St. Petersb.* 8: 315 (1822). Synonym: *O. striata* Ledeb. in Link, Enum. Hort. Berol. Alt. 1 : 377 (1821). Link mispelled Ledebour's epithet as *"striata"* teste Dietrich (1977), *Ann. Missouri Bot. Gard.* 64:536 and Rostanski, *Watsonia* 14 : 31 (1982).

(*) **Opuntia aurantiaca** Lindley in *Edwards, Bot. Reg.* 19 : t. 1606 (1833). Cactaceae. M33 or 34 on crown land c. 2 km from Rushworth, iii. 1980, *Insp. Crosbie.* Being controlled by mechanical means but still persists in July 1984 (W.T. Parsons, pers. comm.).

Oxalis chnoodes Lourt., *Phytologia* 42 : 174-176 (1979). Oxalidaceae. Y46, Amboyne Creek area, 11 km SW. of Tubbut P.O., 22.i.1980, *A.C. Beauglehole ACB 67727* (MEL 604236). Also VZ.

Oxalis corniculata group: J. Thompson, *Austral Syst. Bot. Soc. Newsletter* 32 : 4 (1982), gives a key to the Australian species of this complex distinguished by Lourteig, *Phytologia* 42:57-195 (1979). Native species given are *O. chnoodes* Lourt., *O. exilis* Cunn., *O. perennans* Haw., *O. radicosa* A. Rich, and *O. rubens* Haw.; introduced species are **O. corniculata* L. and **O.* sp. Thompson recommends following the illustrations but not the descriptions of Lourteig and indicates that the collecting of good *Oxalis* specimens with underground parts, flowers, mature fruits, seeds and notes on habitat (especially soil-type) is necessary.

Pachycornia arbuscula (R. Br.) A.J. Scott. See *Sclerostegia arbuscula* (R. Br.) Paul G. Wilson.

Pachycornia tenuis (Benth.) J. Black. See *Sclerostegia tenuis* (Benth.) Paul G. Wilson.

Paspalum distichum L. or **P. paspalodes** (Michaux) Scribner. See Todd (1979:195) for earlier discussion. Debate has continued. Renvoize & Clayton, *Taxon* 29: 339-340 (1980), propose rejection of the name *Paspalum distichum* L. but Guedes, *Taxon* 30 : 301 (1981), favours its retention for the species which has been known for so long by that name.

(*) **Passiflora edulis** Sims, *Bot. Mag.* 45:t. 1989 (1818). Passifloraceae. Satterthwait, in Fl. Australia 8:154-156 (1982) lists this species as naturalized in the moister regions of Queensland, N.S.W. & Victoria. MEL holds only one specimen — S 37, Woori Yallock Picnic Ground area, ± 0.5 km NW of Yellingbo, 22.iii.1976, *A.C. Beauglehole ACB 50415* (MEL 529805).

(*) **Passiflora mollissima** (Kunth) L. Bailey, *Rhodora* 18 : 156 (1916). Satterthwait, Fl. Australia 8:154 (1982), records this for Victoria and cites N54, Sherbrook Forest, 3.ii.1977, *Gullan 32 & A. Opie* (MEL).

***Pentamenes aethiopica** sensu J.H. Willis (1970:342), non (L.) E. Phillips. See **Chasmanthe floribunda.*

Pentatropis quinquepartita (F. Muell) Benth. See *Rhyncharrhena linearis.*

Phyllanthus trachyspermus F. Muell. See *Sauropus trachyspermus.*

(*) **Physalis lanceifolia** Nees, *Linnaea* 6:473 (1831). Solanaceae. Recorded for Victoria by Symon, *J. Adelaide Bot. Gard.* 3:152 (1981). R9, Wodonga, 21.iii.1951, *McBarron 5516* (NSW).

(*) **Physalis pubescens** L., Sp. Pl. 1 : 183 (1753). Solanaceae. Recorded for Victoria by Symon et al., Fl. Australia 29 : 183 (1982), as an uncommon weed from isolated localities in Victoria. C, near Dimboola, 20.iii.1898, *Anon.* (MEL).

(*) **Physalis virginiana** Miller, Gard. Dict. 8th edn, no. 4, (1768). Solanaceae. Recorded as a weed of cultivation in scattered localities in Victoria by Symon, *J. Adelaide Bot. Gard* 3. :158 (1981) and Symon et al., Fl. Australia 29:184 (1982). Symon mentions that Willis

(1973:548) referred to this species as *P. angulata* L. and did not consider it to be naturalized. R.

Pimelea axiflora F. Muell. ex Meissner ssp. **alpina** (F. Muell. ex Benth.) Threlfall, *Brunonia* 5:157 (1982). Basionym: *P. axiflora* var. (?) *alpina* F. Muell. ex Benth.

Pimelea axiflora F. Muell. ex. Meissner var. (?) **alpina** F. Muell. ex Benth. See *P. axiflora* ssp. *alpina* (F. Muell. ex Benth.) Threlfall.

Pimelea curviflora R. Br. ssp. **micrantha** (F. Muell. ex. Meissner) Threlfall, *Brunonia* 5:184(1982). Basionym: *P. micrantha* F. Muell. ex Meissner.

Pimelea curviflora ssp. **gracilis** var. **divergens** Threlfall, *Brunonia* 5:189 (1982). J38, Wickliffe, 9.xi.1903, sine coll. (MEL).

Pimelea curviflora ssp. **gracilis** (R. Br.) Threlfall, op. cit. 185, var. **gracilis**, op. cit. 186. Widespread in Victoria.

Pimelea curviflora ssp. **gracilis** var. **sericea** Benth., Flor. Aust. 6:31 (1873). Threlfall, *Brunonia* 5:187 (1982) records widespread distribution in Victoria.

Pimelea dichotoma Schldl. See *P. flava* ssp. *dichotoma.*

Pimelea flava R. Br. ssp. **dichotoma** (Schldl.) Threlfall, *Brunonia* 5:169 (1982). Basionym: *P. dichotoma* Schldl.

Pimelea ligustrina Labill. ssp. **ligustrina.** Teste Threlfall, op. cit. 128-131, widespread in southern Victoria.

Pimelea ligustrina ssp. **ciliata** Threlfall, op. cit. 131. Eastern and north-eastern Victoria.

Pimelea linifolia Sm. ssp. **caesia** Threlfall, op. cit. 142. Eastern and north-eastern Victoria.

Pimelea linifolia Smith ssp. **linifolia.** Synonym: *P. spathulata* Benth. teste Threlfall, op. cit. 137-143. Widespread in Victoria.

Pimelea linifolia ssp. **linoides** (Cunn.) Threlfall, op. cit. 142. Eastern and north-eastern Victoria.

Pimelea micrantha F. Muell. ex Meissner. See *P. curviflora* ssp. *micrantha.*

Pimelea microcephala R. Br. ssp. **microcephala.** Teste Threlfall, op. cit. 160-163, this is the only subspecies present in Victoria.

Pimelea octophylla R. Br. ssp. **octophylla.** Teste Threlfall, op. cit. 175-180, this is the only subspecies present in Victoria.

Pimelea simplex F. Muell. ssp. **simplex.** Teste Threlfall, op. cit. 150-152, this is the only subspecies present in Victoria.

***Plantago myosurus** Lam., Tabl. Encycl. 1:342 (1792) ssp. **myosurus.** Plantaginaceae. N 50, Laverton North, 25.iii.1977 *Stuwe 141* (MEL).

Plinthanthesis Steud. See *Danthonia.*

Poa cheelii Vick., *Contr. New South Wales Natl. Herb* 4 : 195 & 196 (1970). Gramineae. W51, Kalimna, 2 km NW. of Lakes Entrance, 8.iv.1975, *Cameron 3337* (MEL).

Pogonolepis muelleriana (Sonder) P. Short, *Muelleria* 4: 413 (1981). Synonym: *Angianthus strictus* auct. incl. J.H. Willis (1973:730), non (Steetz) Benth.

Prosopis L. sp. Mimosaceae. B41, 3 km N. of Swan Hill, 9.vii.1980, *W.T. Parsons* (MEL 569146 & 569147).

Pseudognaphalium luteo-album(L.) Hilliard & Burtt, *J. Linn. Soc., Bot.* 82:206 (1981). Basionym: *Gnaphalium luteo-album* L.

Psoralea australasica Schldl., *Linnaea* 20:668 no. 197 (misprint for 196) (1847). Teste Lee, *Telopea* 2:131 (1980), this includes *P. patens* auct., incl. J.H. Willis (1973:301), non Lindley.

Psoralea eriantha auct., incl. J.H. Willis (1973:300), non Benth. See. *P. pallida.*

Psoralea eriantha Benth. See *P. patens.*

Psoralea pallida N. Burb., *Telopea* 2:127-128 (1980). Synonym: *P. eriantha* auct., incl. J.H. Willis (1973:300), non Benth. Papilionaceae. AG. For fuller distribution information see Lee, *Telopea* 2:141 (1980).

Psoralea patens auct., incl. J.H. Willis (1973:301), non Lindley. See *P. australasica.*

Psoralea patens Lindley in T. Mitch., Three Exped. Interior East Austral. 2:8 (1838). Synonym: *P. eriantha* Benth. teste Lee, *Telopea* 2:135, 137 (1980). Papilionaceae. F49, Kooloonong, c. 45 miles NW. of Swan Hill, xi.1961 *Macfarlane* (NSW).

Rhagodia baccata sensu J.H. Willis (1973:83), non (Labill.) Moq. See *R. candolleana* ssp. *candolleana.*

Rhagodia candolleana Moq., Chenop. Monogr. Enum. 10 (1840) ssp. **candolleana.** Synonym: *R. baccata* sensu J.H. Willis (1973:83), non (Labill.) Moq. teste Paul G. Wilson, *Nuytsia* 4:214-215 (1983).

Rhagodia gaudichaudiana sensu J.H. Willis (1973:83), pro parte majore, non Moq. See *Chenopodium curvispicatum.*

Rhagodia gaudichaudiana Moq. is the basionym of *Chenopodium gaudichaudianum* (Moq.) Paul G. Wilson, *Nuytsia* 4:160-161 (1983), a species which is not known from Victoria.

Rhagodia hastata R. Br. See *Einadia hastata.*

Rhagodia nutans R. Br. See *Einadia nutans.*

Rhagodia ulicina (Gand.) Paul G. Wilson, op. cit. 53. Chenopodiaceae. A26 & 33 (MEL) teste Wilson, op. cit. 219-220.

Rhaponticum australe (Gaudich.) Soskov. *Novosti Sistematiki Vysshikh. Rastenii* 8:255 (1971). Basionym: *Leuzea australis* Gaudich. in Freyc., Voy. aut. Monde (Bot.) 462, t. 92 (1906). Synonym: *Centaurea australis* (Gaudich.) Benth & J.D. Hook.. J.H. Willis (1973:765), though giving the same reference as here for the basionym, erroneously attributed it to Cassini.

Rhyncharrhena linearis (Decne) K.L. Wilson, *Telopea* 2 : 38 (1980). Synonym: *Pentatropis quinquepartita* (F. Muell). Benth.

Rorippa islandica sensu J.H. Willis (1973:182), non (Oeder ex Murray) Borbas. See *R. palustris.*

***Rorippa microphylla** (Boenn. ex Reichb.) Hylander, *Rep. Univ. Inst. Appl. Sci. Reykj. Dept. Ag. Bull.* 3:109 (1948). Basionym: *Nasturtium microphyllum* Boenn. ex Reichb., Icon. Fl. Germ. 1:15 (1832) teste Hewson, Fl. Australia 8: 324 (1982).

***Rorippa nasturtiumaquaticum** (L.) Hayek, Sched, Fl. Stiriac. 22 (1905). Synonym: *Nasturtium officinale* R. Br. teste Hewson, Fl. Australia 8:323 (1982).

***Rorippa palustris** (L.) Besser, Enum, Pl. 27 (1822). Synonym: *R. islandica* sensu J.H. Willis (1973: 182), non (Oeder ex Murray) Borbas teste Hewson Fl. Australia 8: 323 (1982).

Ruppia L., Jacobs & Brock, *Aquatic Bot.* 14:325-337 (1982), conclude that this genus is best placed in the family Potamogetonaceae.

Ruppia megacarpa R. Mason, *New Zealand J. Bot.* 5:525-528 (1967). Potamogetonaceae. Recorded for Victoria by Jacobs & Brock, *Aquatic Bot.* 14:335-336 (1982). DGHPWX.

Ruppia polycarpa R. Mason, *New Zealand J. Bot.* 14:524 (1967). Potamogetonaceae. Recorded for Victoria by Jacobs & Brock, *Aquatic Bot.* 14:334 (1982). CDEJNPXZ.

Ruppia tuberosa J. Davies & Toml., *J. Arnold Arbor,* 55:60-62 (1974). Potamogetonaceae. Recorded for Victoria by Jacobs & Brock, *Aquatic Bot.* 14:332 (1982). ENPX.

Sarcocornia quinqueflora (Bunge ex Ung.-Sternb.) A.J. Scott, *J. Linn Soc., Bot.* 75:368 (1977). Basionym: *Salicornia quinqueflora* Bunge ex Ung.-Sternb. Teste Wilson, *Nuytsia* 3:73 & 75 (1980), ssp. *quinqueflora* is in Victoria. Ssp. *tasmanica* Paul G. Wilson, op. cit. 74, may be in Victoria (P-Mt. Martha) but the solitary specimen is not in fruit so confirmation is required.

Sauropus trachyspermus (F. Muell.) Airy Shaw, *Kew Bull.* 35:685 (1980). Basionym: *Phyllanthus trachyspermus* F. Muell. Synonym: *Synostemon trachyspermus* (F. Muell.) Airy Shaw in Jessop (ed.) Fl. Central Australia (1981:193), nom. invalid. There are two recent records; A6, Victoria bank of the Murray River near Wentworth, N.S.W., 28.iv.1957, Plant No. 1021 in Herb. E. Ramsay at Mildura Arts Centre and A36, Murray-Kulkyne Park, c. 10 km SE of Colignan store, 10.xii.1981, *J.H. Browne 71* (MEL 601290).

Schoenoplectus dissachanthus (S.T. Blake) Raynal, *Adansonia* 16:139 (1976). Basionym: *Scirpus dissachanthus* S.T. Blake teste Wilson, *Telopea* 2:160 (1981).

***Schoenoplectus erectus** (Poiret) Palla ex Raynal, *Adansonia* 16:141 (1976). Synonym: *Scirpus lateriflorus* sensu J.H. Willis (1970:227), non Gmelin.

***Schoenoplectus lineolatus** (Franch. & Sav.) T. Koyama in Hui-Lin Li et al., Fl. Taiwan 5:215, pl. 1322 (1979). Synonym: *Scirpus forsythii* Kük. teste K.L. Wilson, *Telopea* 2:160 (1981), who suggests that the sporadic occurrences indicate that it is an introduced species.

Schoenoplectus pungens (Vahl) Palla, *Bot. Jahrb. Syst.* 10:299 (1889). Basionym: *Scirpus pungens* Vahl teste K.L. Wilson, *Telopea* 2:161 (1981), who comments on the widespread confusion of this species with *Scirpus americanus* auct., non (Pers.) Volkart.

Schoenoplectus validus (Vahl) A. & D. Loeve, *Bull. Torrey Bot. Club* 81:33 (1954). Basionym: *Scirpus validus* Vahl. teste K.L. Wilson, *Telopea* 2:161 (1981).
Scirpus antarcticus auct., incl. J.H. Willis (1970:229), non L. See *Isolepis marginata.*
Scirpus aucklandicus (J.D. Hook.) Boeckler. See *Isolepis aucklandica.*
Scirpus australiensis (Maiden & Betche) S.T. Blake. See *Isolepis australiensis.*
Scirpus cernuus Vahl. See *Isolepis cernua.*
Scirpus congruus (Nees) S.T. Blake. See *Isolepis congrua.*
Scirpus crassiusculus (J.D. Hook) Benth. See *Isolepis crassiuscula.*
Scirpus dissachanthus S.T. Blake. See *Schoenoplectus dissachanthus.*
Scirpus erectus Poiret. See *Schoenoplectus erectus.*
Scirpus fluitans L. See *Isolepis fluitans.*
Scirpus fluviatilis sensu J.H. Willis (1970:226), non (Torr.) A. Gray. See *Bolboschoenus medianus.*
Scirpus forsythii Kük. See *Schoenoplectus lineolatus.*
Scirpus gunnii Boeckler. See *Isolepis alpina.*
Scirpus habrus Edgar. See *Isolepis habra.*
Scirpus hookerianus (Boeckler) S.T. Blake. See *Isolepis hookeriana.*
***Scirpus hystrix** Thunb. See **Isolepis hystrix.*
Scirpus inundatus (R. Br.) Poiret (including var. *floribundus* Benth.). See *Isolepis inundata.*
Scirpus lateriflorus sensu J.H. Willis (1970:227), non Gmelin. See *Schoenoplectus erectus.*
Scirpus marginatus Thunb. See *Isolepis marginata.*
Scirpus merrillii (Palla) Kük. ex. Merr. See *Isolepis subtilissima.*
Scirpus montivagus S.T. Blake. See *Isolepis montivaga.*
Scirpus nodosus Rottb. See *Isolepis nodosa.*
Scirpus platycarpus S.T. Blake. See *Isolepis platycarpa.*
Scirpus productus C.B. Clarke. See *Isolepis producta.*
***Scirpus prolifer** Rottb. See ***Isolepis prolifera.*
Scirpus pungens Vahl. See *Schoenoplectus pungens.*
Scirpus stellatus C.B. Clarke. See *Isolepis stellata.*
Scirpus subtilissimus (Boeckler) S.T. Blake. See *Isolepis subtilissima.*
Scirpus validus Vahl. See *Schoenoplectus validus.*
Scirpus victoriensis Wakef. See *Isolepis victoriensis.*
Scirpus wakefieldianus S.T. Blake. See *Isolepis wakefieldiana.*
Sclerolitum atriplicinum (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn. 16c: 495 (1934). P.G. Wilson, *Nuytsia* 4:197 (1983), has adopted this name for *Chenopodium atriplicinum* (F. Muell.) F. Muell.
Sclerolaena decurrens (J. Black) A.J. Scott, *Feddes Repert.* 89: 112 (1978). Chenopodiaceae. A6, S. of Abbotsford Bridge, 7.ix.1980 *J.H. Browne* (MEL 2000544).
Sclerolaena lanicuspis (F. Muell.) Benth., Fl. Austral. 5:195 (1870). Chenopodiaceae. A17, near Bottle Bend on Murray River, SE. of Red Cliffs, 21.x.1980, *J.H. Browne* (MEL 2000545). One plant only; common across the river in N.S.W.
Sclerostegia arbuscula (R. Br.) Paul G. Wilson. Synonyms: *Arthrocenemum arbusculum* (R. Br.) Moq.; *Pachycornia arbuscula* (R. Br.) A.J. Scott.
Sclerostegia disarticulata Paul G. Wilson, *Nuytsia* 3:19 (1980). Chenopodiaceae. Two Victorian localities shown on map, Wilson op. cit. 141, but no Victorian specimen at MEL.
Sclerostegia tenuis (Benth.) Paul G. Wilson, *Nuytsia* 3:22 (1980). Chenopodiaceae. Grid A.
Senecio cahillii Belcher, *Muelleria* 5:120-122 (1983). Compositae. W7, Buchan River near junction of Reedy River, 6.ii.1973 *A.C. Beauglehole 41406* (MEL 501429).
Senecio macrocarpus F. Muell. ex Belcher, *Muelleria* 5:119-120 (1983). Compositae. EJNP.
Sicyos angulatus auct., incl. J.H. Willis (1973:624). See *S. australis.*
Sicyos australis Endl. Prodr. Fl. Norfolk. 67 (1833). Synonym: *S. angulatus* auct., incl. Benth., Fl. Austral. 3:332 (1866) and J.H. Willis (1973:624), non L., teste Telford, Fl. Australia 8:193 (1982).
***Silene alba** (Miller) E.H. Krause. See *S. pratensis.*
***Silene pratensis** (Rafn.) Godron & Gren. in Gren. & Godron, Fl. Fr. 1:216 (1847). Synonym: *S. alba* (Miller) E.H. Krause (1901), non Muhlenb. ex Britton (1893).
***Solanum americanum** Miller, *Gard. Dict.* 8th edn, Art. Solanum No. 5 (1768). Synonym:

S. nodiflorum Jacq.; *S. nodiflorum* ssp. *nutans* R. Henderson, *Contr. Queensland Herb.* 16:30, t. 2 (1974), teste Symon, *J. Adelaide Bot. Gard.* 4:37-40 (1981) and Fl. Australia 29: 95,98 (1982). Symon (loc. cit. 98) states that there is still disagreement as to the correct name for the taxon previously called *S. nodiflorum* Jacq. in much Australian literature.

*Solanum chenopodioides Lam., Tabl. Encycl. 2:18 (1794). Synonyms: *S. ottonis* sensu J.H. Willis (1973:552), non Hylander, teste Symon, *J. Adelaide Bot. Gard.* 4:44-46 (1981); *S. gracile* Dunal (1852), non Sendtner (1846); *S. gracilius* Herter (1943), based on *S. gracile* Dunal — see Fl. Australia 29:98-99 (1982).

Solanum coactiliferum J. Black., *Trans. & Proc. Roy. Soc. S. Austral.* 33;224 (1909). Solanaceae. Recorded for Victoria by Symon, *J. Adelaide Bot. Gard.* 4:167 (1981). F.

*Solanum douglasii Dunal. Henderson, *Contr. Queensland Herb.* 16:58-60 (1974), states that the material on which Willis (1973:551) based his record of this species in Victoria is referable to **S. furcatum* Dunal. Symon, *J. Adelaide Bot. Gard.* 4:42-43 (1981), reports a subsequent genuine collection of *S. douglasii* from P13/14, Quarantine Station Reserve, Point Nepean, 8.viii.1973, *J.H. Willis* (ADW, MEL).

Solanum gracilius Herter. See **S. chenopodioides.*

Solanum linerarifolium Herasimenko. See *S. linearifolium* Herasimenko ex Symon.

Solanum linearifolium Herasimenko ex Symon, *J. Adelaide Bot. Gard.* 4:81, t. 20 (1981). Symon published this name as a new species because *S. linearifolium* Herasimenko, *Byull Glavn. Bot. Sada* 59:71-72 (1965), is invalid as no type specimen was designated for it. Symon notes two alternative transliterations of the author's name — Gerasimenko and Herasimenko. As Herasimenko has been used in Fl. Australia 29:112 (1982) and in the Draft Index of Author Abbreviations compiled at The Herbarium, Royal Botanic Gardens, Kew (1980), it is used here.

*Solanum nitidibaccatum Bitter. See **S. saccharoides.*

Solanum nodiflorum Jacq. See *S. americanum.*

Solanum nodiflorum Jacq. ssp. nutans R. Henderson. See *S. americanum.*

*Solanum ottonis sensu J.H. Willis (1973:552), non Hylander. See **S. chenopodioides* Lam.

*Solanum sarrachoides Sendtner in C. Martius, Fl. Bras. 10:18 (1846). Synonym: *S. nitidibaccatum* Bitter, teste Symon et al., Fl. Australia 29:100 (1982).

*Soliva anthemifolia (Juss.) R.Br. ex Loudon, Hort. Brit. 364 (1830). The publication of this combination by Loudon precedes Lessing's publication of it (Syn. Gen. Compos. 268 (1832)) by two years. Compositae. Q37, in Victoria c. 3 km SW of Tocumwal, N.S.W., 4.vi.1979, *A.C. Beauglehole ACB 63962* (MEL). See Aston, *Victorian Naturalist* 99:190-191 (1982).

Soliva sp. Compositae. Recorded for Victoria by Aston, op. cit. 193. Identity not certain. N and W45/Z37 border (Lake Corringle area).

*Soliva stolonifera (Brot.) Loudon, Hort. Brit. 364 (1830). Compositae. L52, Long Plain, Barmah State Forest, 31.ix.1979, *E. Chesterfield* (MEL); R14, 5 km N to NNE of Mt Killawarra, 13.x.1981, *E. Chesterfield* (MEL). See Aston, op. cit. 192-193.

*Soliva valdiviana Philippi, *Linnaea* 33:168 (1864-1865). Compositae. Recorded for Victoria by Aston, op. cit. 193. N (suburban Melbourne).

Stipa bigeniculata Hughes, *Kew Bull.* 1922:20 (1922). Gramineae. Townrow, *Pap. & Proc. Roy. Soc. Tasmania* 112:255 (1978), regards this species as distinct from *S. blackii* C.E. Hubb. and records it for Victoria. N.

Stipa curticoma Vick., *Telopea* 2:11 (1980). Gramineae. C42, Mt. Arapiles, 20.xi.1968, *A.C. Beauglehole ACB 29667* (MEL).

Stipa gibbosa Vick., *Telopea* 2:14 (1980). Gramineae. Vickery cites 2 Victorian collections, C?24, 4-7km from Dimboola toward Nhill, 11.xi.1969, *Canning 2972* (CBG 067316 in part) and N50, 1 mile S of Laverton, 22.xi.1967, *J. Cullimore 125* (AD, PERTH). MEL holds no material.

Stipa nervosa Vick. See *S. rudis* ssp. *nervosa.*

Stipa rudis Sprengel, Syst. Veg. 4, Cur. Post. 31(1827). Synonym: *S. nervosa* Vick., teste Everett & Jacobs, *Telopea* 2:394 (1983).

Stipa rudis ssp. australis J. Everett & S. Jacobs, op. cit. 396. WZ.

Stipa rudis ssp. **nervosa** (Vick.) J. Everett & S. Jacobs, op. cit. 396. Basionym: *S. nervosa* var. *nervosa* Vick. RX.

Stipa rudis ssp. **rudis**. Synonym: *S. nervosa* var. *neutralis* Vick. SZ.

Swainsona galegifolia (Andrews) R. Br. ex Aiton, Hort. Kew. 2nd edn, 4:327 (1812). Papilionaceae. R7, Long Gully Road, Indigo, xi.1980, *A. Moon* (MEL). Formerly common in the district but now rare. R.

Swainsona stipularis F. Muell. var. **purpurea** A. Lee, *Contr. New South Wales Natl Herb.* 1:213 (1948). Papilionaceae. A33, Raak Plain 6.6 km N of railway line, 30.ix.1980, J.H. Browne (MEL 582169).

Synostemon trachyspermus (F. Muell.) Airy Shaw. See *Sauropus trachyspermus.*

Tetrarrhena distichophylla (Labill.) R. Br. See *Ehrharta distichophylla.*

Thelypteris confluens (Thunb.) Morton, *Contr. U.S. Natl. Herb.* 38:71 (1967). Thelypteridaceae. Reported for Victoria by Green & Walsh, *Victorian Naturalist* 101:135-137 (1984). (MEL 609818). V28.

Thysanotus dichotomus sensu J.H. Willis (1970:307), non (Labill.) R. Br. See *T. juncifolius.*

Thysanotus juncifolius (Salisb.) J.H. Willis & Court. Includes *T. dichotomus* sensu J.H. Willis (1970:307), non (Labill.) R. Br., teste Brittan, *Brunonia* 4:104(1981).

Thysanotus patersonii R. Br. ssp. **patersonii** is the subspecies present in Victoria, teste Brittan, op. cit. 137-139 incl. map 138.

Thysanotus tuberosus R. Br. ssp. **parviflorus** (Benth.) Brittan, op. cit. 173. Liliaceae. Includes C?24, Shire of Dimboola, 8.xii.1895, *Reader* (MEL 655810).

Thysanthus tuberosus ssp. **tuberosus**. Present in Victoria, teste Brittan, op. cit. 173. Includes D or J (Grampians), PVZ.

Triglochin procera R. Br. agg. Robb & Ladiges, *Austral. J. Bot.* 29:639-651 (1981), give a numerical analysis of variation within the *T. procera* aggregate in Victoria. This suggests 4 morphologically distinct forms, designated A to D.

Tristania laurina (Smith) R. Br. in Aiton, Hort. Kew. 2nd edn, 4:417 (1812). See *Tristaniopsis laurina.*

Tristaniopsis laurina (Smith) Peter G. Wilson & Waterhouse, *Austral. J. Bot.* 30:435 (1982). Synonym: *Tristania laurina* (Smith) R. Br. in Aiton, loc. cit.

***Vellereophyton dealbatum** (Thunb.) Hilliard & Burtt, *J. Linn Soc., Bot.* 82:210 (1981). Synonym: *Gnaphalium candidissimum* Lam., nom. illegit. (excluded as barely described).

***Viola arvensis** Murray, Prodr. Stirp. Gott. 73 (1770). Synonym : *V. tricolor* auct. (incl. J.H. Willis (1973:396)), non L., teste Adams, Fl. Australia 8:93 (1982).

Viola betonicifolia Smith ssp. **betonicifolia.** Teste Adams, op. cit. 95, this is the only subspecies present in Victoria.

Viola hederacea Labill. A number of subspecies are described by Adams, op. cit. 386-387 with additional information on pp. 97-99. Those present in Victoria are: ssp. **cleistagamoides** L. Adams. op. cit. 386; ssp. **fuscoviolacea** L. Adams, op. cit. 386; ssp. **hederacea** — see op. cit. 97; ssp. **seppeltiana** L. Adams, op. cit. 387; ssp. **sieberiana** (Sprengel.) L. Adams, op. cit. 387. Basionym: *V. sieberiana* Sprengel.

Viola improcera L. Adams, op. cit. 387, 100. Violaceae. Known from 2 collections: S43, Mt. Useful, c. 10 miles SW of Licola (MEL) and W7, Brumby Point, Nunniong Plateau (MEL).

***Viola riviniana** Reichb., Icongr. Bot. Pl. Crit. 1:81 (1823). Recorded by Adams, op. cit. 94, as naturalized in one pasture in western Victoria: D22, near Nareen, 23.xii.1959, *J.H. Willis* (MEL).

Viola sieberiana Sprengel. See *V. hederacea* ssp. *sieberiana.*

***Viola tricolor** auct., incl. J.H. Willis (1973:396), non L. see **V. arvensis.*

Vittadinia australasica (Turcz.) N. Burb., *Brunonia* 5:42-44 (1982) var. **australasica.** Compositae. Western Victoria. ?BC.

Vittadinia australasica (Turcz.) N. Burb. var. **oricola** N. Burb., op. cit. 44. Grid E.

Vittadinia blackii N. Burb., *Proc. Linn. Soc. New South Wales* 93:442 (1969). Burbidge, *Brunonia* 5:46 (1982), states that distribution includes north-west Victoria. However, no Victorian specimens are cited or mapped (map 9). MEL holds one Victorian specimen annotated (4.x.1968) by Burbidge as *"Vittadinia blackii* N.T. Burbidge ms. (achenes

more hairy than usual but leaf characters and acuminate bracts typical)" and cited with her original description.

Vittadinia cervicularis N. Burb. var. **cervicularis**, *Brunonia* 5:37-39 (1982). Grid CJ.

Vittadinia cervicularis N. Burb. var. **subcervicularis** N. Burb, loc. cit. Grid CN.

Vittadinia condyloides N. Burb., op. cit. 47-48. Grid C.

Vittadinia cuneata auct. (incl. Burbidge, *Proc. Linn. Soc. New South Wales* 93:430 (1969) and J.H. Willis (1973:683), non DC. See *V. gracilis.*

Vittadinia cuneata DC., Prodr. 5:281 (1836) var. **cuneata** forma **cuneata.** Compositae. Burbidge, *Brunonia* 5:49-54 (1982), records this forma for Victoria. CHJNRVW.

Vittadinia cuneata DC. var. **cuneata** forma **minor** N. Burb., op. cit. 51. Compositae. CJNWZ.

Vittadinia dissecta (Benth.) N. Burb., op. cit. 56-57, var. **dissecta.** Synonym: *V. triloba* (Gaudich.) DC. var. *dissecta* (Benth.) J. Black. Compositae. W.

Vittadinia dissecta (Benth.) N. Burb. var. **hirta** N. Burb., op. cit. 57. Compositae. BGW.

Vittadinia gracilis (J.D. Hook.) N. Burb., op. cit. 54. Synonyms: *V. cuneata* auct., incl. Burbidge, *Proc. Linn. Soc. New South Wales* 93:439 (1969) and J.H. Willis (1973:683), non DC.; *V. triloba* var. *lanuginosa* J. Black. Compositae. ABCGMNV.

Vittadinia pterochaeta (F. Muell. ex Benth.) J. Black *Trans. Proc. Roy. Soc. S. Austral.* 52:229 (1982). Compositae. Recorded for Victoria by Burbidge *Brunonia* 5:31 (1982). G51, 9 miles from Quambatook, towards Dumosa, *Phillips* (CBG).

Vittadinia tenuissima (Benth.) J. Black, *Trans. & Proc. Roy. Soc. S. Austral.* 52:229 (1982). Compositae. Listed for Victoria by Burbidge, *Brunonia* 5:46-47 (1982). Murendal River, *Howitt 389* (MEL). Presumably this is Murrindal River, grid W26, W17 and W35.

Vittadinia triloba (Gaudich.) DC. var. **dissecta** (Benth.) J. Black. See *V. dissecta.*

Wolffia angusta Landolt, *Veroff. Geobot. Inst. ETH Stiftung Rubel Zurich* 70:29 (1980). Lemnaceae. K12, Lake Terang, iv.1875, *Mueller* (MEL 87259). Also in grids KLM, determined by Landolt from living material (Aston 1984, pers. comm.).

Wurmbea biglandulosa (R. Br.) T.D. Macfarlane, *Brunonia* 3:191 (1980). Liliaceae. (MEL). VW.

Wurmbea dioica (R. Br.) F. Muell, *Fragm.* 10:119 (1877). Basionym: *Anguillaria dioica* R. Br. teste Macfarlane, op. cit. 159.

Wurmbea latifolia T.D. Macfarlane, op. cit. 170. Liliaceae. (MEL). CEHJKNOPZ.

Wurmbea uniflora (R. Br.) T.D. Macfarlane, op. cit. 194. Liliaceae. (MEL). WZ.

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Many people, most of them members of staff of the National Herbarium, Melbourne, have contributed to the information collected in this conspectus. Since my retirement from full-time duties at the Herbarium early in 1981 members of the Herbarium staff have drawn my attention to unpublished records for additional species in Victoria. For some time Mr Stephen Forbes has been the chief one to do this. The Assistant Government Botanist, Dr J. H. Ross, has discussed many points with me. Others who have helped include Miss H. Aston, Miss H. Cohn, Mr D. Cooke, Mrs M. Corrick, Miss O. Evans, Mr D. Foreman, Dr R. F. Parsons, Dr W. T. Parsons and Dr P. S. Short together with those mentioned incidentally in the text, particularly those who collected new plants. The author wishes to thank all these people.

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SEVEN NEW SPECIES OF HELICIA LOUR. (PROTEACEAE) FROM PAPUA NEW GUINEA

by

D. B. Foreman *

ABSTRACT

Foreman, D. B. Seven new species of *Helicia* Lour. (Proteaceae) from Papua New Guinea. *Muelleria* 6(1): 79-91 (1985). — Seven new species of *Helicia* Lour., *H. calocoma, H. insularis, H. laiagamensis, H. polyosmoides, H. retusa, H. rostrata* and *H. subcordata,* are described and illustrated together with notes on distribution, habitat and diagnostic features.

INTRODUCTION

In a previous paper (Foreman 1983) three new species of *Helicia* from north Queensland were described together with descriptions of all the presently recognised Australian species. The main points made in the introduction to that paper are also relevant to this study and should be consulted.

The present paper provides names for the account of the Proteaceae being prepared by the author for the 'Handbooks of the Flora of Papua New Guinea' series. That account will include a key to all species of *Helicia* now recognised as occurring in Papua New Guinea together with descriptions and notes on distribution and habitat.

The geographical regions adopted by the 'Handbooks' series (Henty 1981) have been used in this paper.

TAXONOMY

Helicia calocoma D. Foreman, sp.nov.

Arbor ad 27 m alta. *Ramuli* teretes, atro-rufo-tomentosi. *Folii lamina* oblonga ad ellipticam, acuta ad acuminatam, ad basin cuneata vel interdum obliqua, integra, 16-22 cm longa, 6-7.5 cm lata, undique atro-rufo-tomentosa, supra glabrescens, subcoriacea ad coriaceam; nervorum 12-15 pares; petiolus 4-6 cm longus, atro-rufo-tomentosus. *Inflorescentia* ramiflora, 7-17 cm longa, atro-rufo-tomentosa. *Pedicelli* 2-4 mm longi, rufo-tomentosi. *Perianthium* 2.5 cm longum, dense rufo-tomentosum. *Ovarium* rufo-tomentosum. *Fructus* (immaturus) ellipsoideus ad ± ovoideum, c. 3 x 1.5 cm, ± rufo-tomentosus, glabrescens; pericarpium coriaceum.

Tree to 27 m tall. *Branchlets* terete, dark rufous-tomentose. *Leaf blade* oblong to elliptic, acute to acuminate, cuneate or sometimes oblique at the base, entire, 16-22 cm long, 6-7.5 cm wide, subcoriaceous to coriaceous, at first dark rufous-tomentose all over, later ± glabrous and drying a dull green to yellowish-green above with some dark rufous hairs persisting along the midrib and main nerves, the undersurface remaining dark rufous-tomentose, midrib slightly raised above, very prominent beneath; nerves 12-15 pairs, flattened or slightly raised above, ± straight in the lower two-thirds, becoming curved and interarched towards the margin; reticulations dense, slightly raised, clearly visible on both surfaces; petiole 4-6 cm long, dark rufous-tomentose. *Inflorescence* ramiflorous, 7-17 cm long, dark rufous-tomentose; rachis c. 3 mm diam. *Bract* subtending flower pairs (unit infloresence) rufous-tomentose, ovate-acute, about 1.5 mm long; floral bracts ± similar. *Peduncle* (of unit inflorescence) 2-2.5 mm long, rufous-tomentose. *Pedicels* 2-4 mm long, rufous-tomentose. *Perianth* 2.5 cm long, densely rufous-tomentose; limb 7 x 3.5 mm. *Anthers* 3-4 mm long. *Hypogynous glands* obtuse. *Ovary* ferruginous-tomentose; style glabrous. *Fruit* (immature) ellipsoid to ± ovoid, about 3 x 1.5 cm, ± rufous-tomentose, becoming glabrous, apex ± pointed, base rounded; pericarp coriaceous. (Fig 1).

* National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

Fig. 1. *Helicia calocoma*. A — branchlet with young buds. B — inflorescence with almost mature buds. From the type collection.

TYPE COLLECTION:

Above Arora Village, Upper Wau Valley, Morobe district, northeastern New Guinea, 25.vi.1973, *J. S. Womersley NGF 41248* (flowering collection). (Holotype: LAE. Isotypes: A, BRI, CANB, K, NSW).

FURTHER SPECIMEN EXAMINED:

Northeastern New Guinea. Morobe district — New Yamap, head of Biame Creek, 19.iii.1970, *H. Streimann & A. Kairo NGF 47647* (A, BRI, A, BRI, CANB, K, LAE, NSW); Kaisinik, 44 km along N.N.G. logging road, 30.v.1976, *A. Masapuhafo AM5* (LAE).

DISTRIBUTION AND HABITAT:

Known only from a restricted area in the Morobe district of northeastern New Guinea. Found in *Nothofagus* forest at altitudes ranging from 1200 — 2000 m.

DISCUSSION:

H. calocoma can be distinguished immediately from all other *Helicia* species in Papua New Guinea by its very long petioles and the very distinctive and attractive rufous-tomentose indumentum which completely covers the twigs, petioles, leaves and all parts of the inflorescence and flowers.

It is difficult to assess the relationships of *H. calocoma* and mature fruits, when found, may assist. The species shares an important combination of characters viz., ovary hairy, leaves and branchlets hairy to a greater or lesser degree and leaves entire or almost so, with a group of eight species that includes taxa such as *H. amplifolia* Sleum., *H. oreadum* Diels, *H. platyphylla* Sleum. and *H. sellae-montis* Sleum. However, none of these taxa has particularly long petioles nor do they in general have such a dense and persistent indumentum as is found in *H. calocoma*.

Helicia insularis D. Foreman, sp.nov.

Arbor 8-15 m alta. *Ramuli* glabri; cicatrices foliorum prominentes. *Folii lamina* ± elliptica, mucronata ad obtusam, ad basin attenuata, integra, 5.5-12.5 cm longa, 3.5-6 cm lata, glabra, chartacea; nervorum c. 8 pares; petiolus 5-8 mm longus. *Inflorescentiae* in axillis superis, c. 5.5 cm longae, glabrae. *Pedicelli* 3 mm longi, glabri. *Perianthium* 13 mm longum, album, glabrum. *Ovarium* glabrum. *Fructus* (immaturus) globosus, glaber.

Tree 8-15 m tall. *Branchlets* glabrous, with prominent leaf-base scars. *Leaf blade* ± elliptic, mucronate to obtuse, attenuate at the base and decurrent onto the petiole, entire, 5.5-12.5 cm long, 3.5-6 cm wide, glabrous, chartaceous to subcoriaceous, drying mid- to dark-green above, mid-brown beneath; midrib raised above, prominent beneath; nerves about 8 pairs, curved upwardly, becoming fainter towards the margin, slightly raised above, raised but fine beneath; reticulations dense, slightly raised on both surfaces; petiole 5-8 mm long, stout. *Inflorescence* axillary, borne towards the ends of the twigs, about 5.5 cm long, glabrous, rachis 1.5 mm diameter. *Bract* subtending flower pairs ovate-acute, 1 mm long; floral bracts slightly smaller. *Peduncle* c. 0.4 mm long, glabrous. *Pedicels* 3 mm long, glabrous. *Perianth* white, 13 mm long, glabrous; limb 3.5 x 1.5 mm. *Anthers* c. 3 mm long. *Hypogynous glands* connate into a crenulate cup. *Ovary* glabrous; style glabrous. *Fruit* (immature) globose, glabrous; pericarp appears homogeneous. (Fig. 2).

TYPE COLLECTION:

Mt. Pabinana, Normanby Island, Papuan Islands, Papua, 2.v.1956, *L. J. Brass 25650* (flowering collection). (Holotype: LAE. Isotype: L, n.v.).

FURTHER SPECIMEN EXAMINED:

Papua. Papuan Islands — Between Agamoia and Ailuluai, Fergusson Island, 9.vi.1956, *L. J. Brass 27042* (L, LAE).

DISTRIBUTION AND HABITAT:

H. insularis is known only from Normanby and Fergusson Islands in the Papuan Islands district and it is this insular location which the specific epithet alludes to. Occurs in mossy forest at altitudes ranging from 800-950 m.

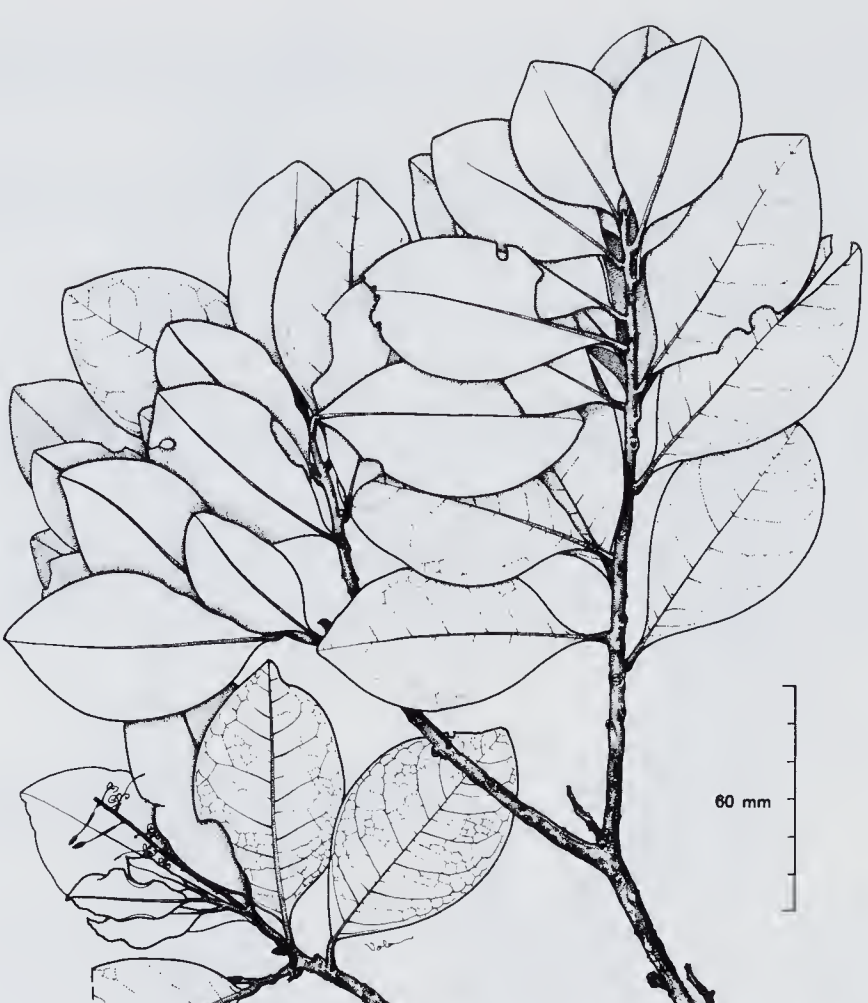

Fig. 2. *Helicia insularis*. Flowering branchlet. Note that the nerves are very difficult to see in the actual specimen, particularly towards the margin; they have been slightly over-emphasised in the drawing. From the type collection.

Discussion:

The most notable difference between *H. insularis* and other *Helicia* species in New Guinea is that it is apparently the only one in which the main lateral veins are not clearly visible at the margin of the leaf on either surface. In most species the veins can usually be seen distinctly on the lower surface even if they are obscure above.

In most leaf, inflorescence and flower characters *H. insularis* appears most closely related to *H. odorata* Diels, a relatively common and widespread species. Although *H. odorata* is not known from either Normanby or Fergusson Islands it has been collected from Mt Goë (in the Mt Suckling complex), Mt Dayman and Mt Simpson in the adjacent Milne Bay district.

Helicia laiagamensis D. Foreman, sp.nov.

Arbor parva ad 10 m alta. *Ramuli* teretes, atro-ferruginoso-tomentosi, glabrescentes. *Folii lamina* plerumque elliptica, interdum obovata, acuta, ad basin cuneata, integra (juvenalis interdum sparsim dentata), 6-16 cm longa, 2.7-6.2 cm lata, undique ferruginoso-tomentosa, supra glabrescens, infra indumento praecipue secus costam et nervos principales persistenti, chartacea ad subcoriacea; nervorum 7-10 pares; petiolus 7-14 mm longus, atro-ferruginoso-tomentosus, glabrescens. *Inflorescentia* axillaris vel ramiflorus, 11.5-33.5 cm longa, dense ferruginoso-appresso-tomentosa. *Pedicelli* 3-4.5 mm longi, ferruginoso-tomentosi. *Perianthium* 8.5-11 mm longum, ferruginoso-appresso-tomentosum. *Ovarium* rufo-tomentosum. *Fructus* ± globosus, 2.5 cm diam., glaber; pericarpium homogeneum, 1.5-2 mm crassum; pedicellus crassus, 2.3 mm longus. *Semen* globosum, 2 cm diam.

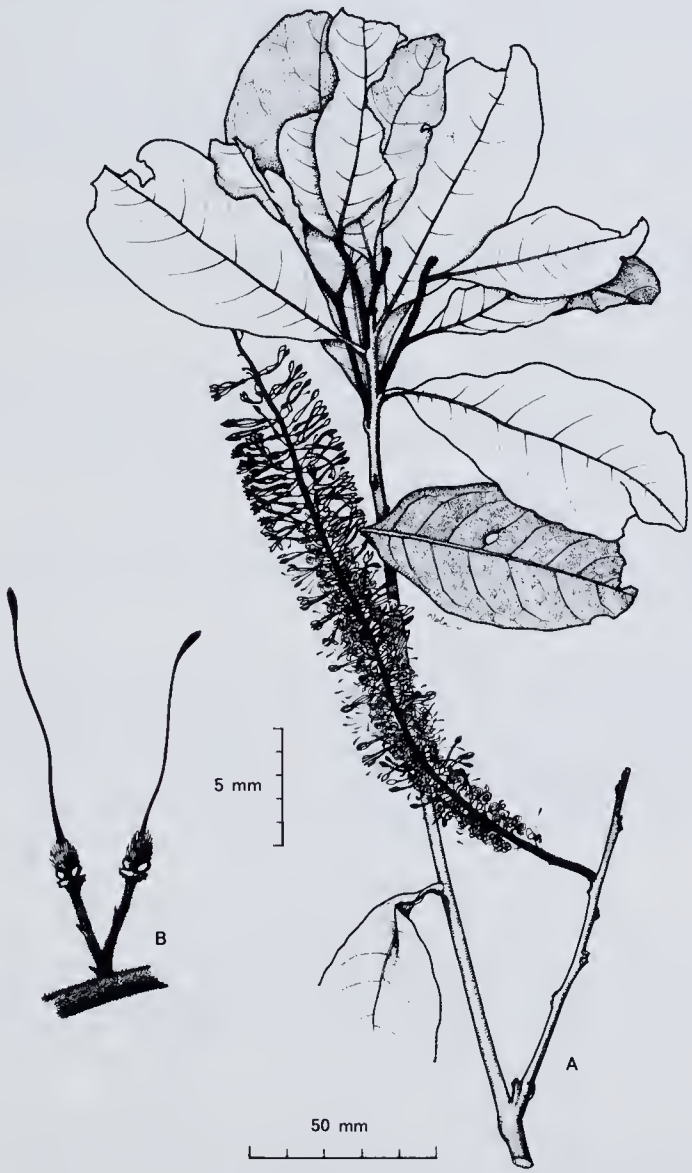

Fig. 3. *Helicia laiagamensis*. A — flowering branchlet. B — a pair of flowers (unit inflorescence) with the perianth parts removed. From the type collection.

Small *tree* to 10 m tall. *Branchlets* terete, dark ferruginous-tomentose, glabrescent. *Leaf blade* mostly elliptic, occasionally obovate, acute, cuneate at the base, entire or sometimes with one or two pairs of irregularly spaced teeth on young leaves, 6-15 cm long, 2.7-6.2 cm wide, chartaceous to subcoriaceous, ferrunginous-tomentose on both surfaces when young, becoming glabrous or with a few hairs persisting along the midrib above, the hairs persisting beneath especially along the midrib and main veins, the blade drying olivaceous above, mid- to dark-brown beneath; midrib slightly raised above, raised and prominent beneath; nerves 7-10 pairs, curved upwardly, slightly impressed or flattened above, prominent beneath; reticulations impressed above, slightly raised beneath; petiole 7-14 mm long, dark-ferruginous-tomentose, glabrescent. *Inflorescence* axillary or ramiflorous, 11.5-33.5 cm long, densely appressed ferruginous-tomentose; rachis 1.5-2 mm diam. *Bract* subtending flower pairs ferruginous-tomentose, ovate-acute, 1 mm long, floral bracts ± similar. *Peduncle* 3-4.5 mm long, ferruginous-tomentose. *Pedicel* 3-4.5 mm long, ferruginous-tomentose. *Perianth* creamy-white, 8.5-11 mm long, appressed ferruginous-tomentose; limb 4 x 1.5 mm. *Anthers* 2.5-3 mm long. *Hypogynous glands* free, broadly rounded. *Ovary* rufous-tomentose; style slender, glabrous. *Fruit* ± globose, 2.5 cm diam., glabrous; pericarp homogeneous, 1.5-2 mm thick. *Seed* globose, 2 cm diam. *Fruit pedicel* stout, 3-5 mm long, 2-3 mm wide. (Fig 3.).

Type Collection:

Near Kepilam Village, Western Highlands district, northeastern New Guinea, 4.viii.1960, *R. D. Hoogland & R. Schodde 7321* (flowering and fruiting collection). (Holotype: LAE. Isotype: CANB).

Further Specimens Examined:

Northeastern New Guinea. Western Highlands district — near Lake Inim, near Wabag, 8.v.1965, *J. R. Flenley 2768* (CANB, LAE); road from Sirunki to Laiagam, 3.viii.1960, *R. G. Robbins 3176* (CANB, LAE); near Sirunki, viii.1962, *Walker ANU 490* (CANB, LAE). Mt Kum near Mt Hagen, 7.v.1957, *J. S. Womersley NGF 9416* (LAE); midway between Sirunki and Laiagam, 11.vii.1971, *J. S. Womersley & B.C. Stone NGF 43771* (LAE).

Distribution and Habitat:

Known only from a restricted area in the Western Highlands district of northeastern New Guinea. Found in primary or secondary montane forest, at altitudes ranging from 2100 — 3000 m.

Discussion:

All specimens come from the Laiagam region in the Western Highlands district of northeastern New Guinea and this localized distribution is the basis for the specific epithet.

Similarities of flower and fruit characters show the close affinities of *H. laiagamensis* to *H. sellae-montis* a species which is widespread throughout the Morobe and Eastern Highlands districts of northeastern New Guinea. *H. laiagamensis* differs from *H. sellae-montis* in having a longer petiole and a leaf blade which is relatively smaller and elliptic in shape; the leaf blade of *H. sellae-montis* is narrow-oblong to obovate.

Helicia polyosmoides D. Foreman, sp.nov.

Arbor 6-15 m alta. *Ramuli* teretes, glabri. *Folii lamina* elliptica, acuta, ad basin attenuata, integra, 12.5-27 cm longa, 5.5-11 cm lata, glabra, coriacea; nervorum ad 10 pares; petiolus 1.5-3 cm longus, ad basin tumidus et rugosus. *Inflorescentia* axillaris ad subterminalem, 13-2 cm longa, parce ferruginoso-pilosa. *Pedicelli* ad 6 mm longi, ferruginoso-pilosi. *Perianthium* 2.5 cm longum, album limbo cremeo, glabrum. *Ovarium* glabrum. *Fructus* ellipsoideus, 1.5 x 1 cm, nitens, atro-caeruleus; pericarpium homogeneum, laeve, 1 mm crassum; pedicellus gracilis, 10 x 2 mm.

Tree 6-15 m tall. *Branchlets* terete, striate, glabrous. *Leaf blade* elliptic, acute, attenuate at the base and decurrent on the petiole, entire, 12.5-27 cm long, 5.5-11 cm wide, glabrous, coriaceous, drying yellow-green; midrib slightly raised above, prominent beneath; nerves up to 10 pairs, slightly raised above, raised and clearly defined beneath, curving upwardly and interarching near the margin; reticulations dense, slightly raised on both surfaces; petiole

1.5-3.0 cm, glabrous, swollen and rugose at the base. *Inflorescence* axillary to subterminal, 13-22 cm long, sparsely ferruginous pilose; rachis 2 mm diam. *Bract* subtending flower pairs glabrous, acuminate, 1.5 mm long, floral bracts ± similar. *Peduncle* 0.5-1mm long, ferruginous-pilose. *Pedicels* up to 6 mm long, ferruginous-pilose. *Perianth* white with a cream limb, 2.5 cm long, glabrous; limb 3-3.5 x 1.5 mm. *Anthers* 2 mm long. *Hypogynous glands* free or connate at the base, truncate. *Ovary* glabrous; style slender, glabrous. *Infructescence* 15-19 cm long. *Fruit* ellipsoid, 1.5 x 1.0 cm, shiny, very dark blue almost black; pericarp smooth, homogeneous, 1 mm thick. *Seed* white, ellipsoid, 10 x 8 mm. *Fruit pedicel* slender, 10 x 2 mm. (Fig. 4).

TYPE COLLECTION:

Near Derimbat Village, Manus Island, Bismarck Archipelago, 30.x.1974, *D. Foreman & P. Katik LAE 59251* (flowering and fruiting collection). (Holotype: LAE. Isotypes: A, BRI, CANB, K, L and NSW).

FURTHER SPECIMENS EXAMINED:

Bismark Archipelago — Mt Dremsel, Manus Island, 26.x.1974, *D. Foreman and P. Katik LAE 59167* (A, BRI, CANB, K, L, LAE, MUN); near Derimbat Village, Manus Island, 21.vi.1971, *B. C. Stone and H. Streimann LAE 53659* (A, BRI, CANB, K, L, LAE).

DISTRIBUTION AND HABITAT:

Known only from Manus Island in the Bismarck Archipelago where it appears to be locally common. Occurs in rainforest on ridges at altitudes of from 100 — c. 600m.

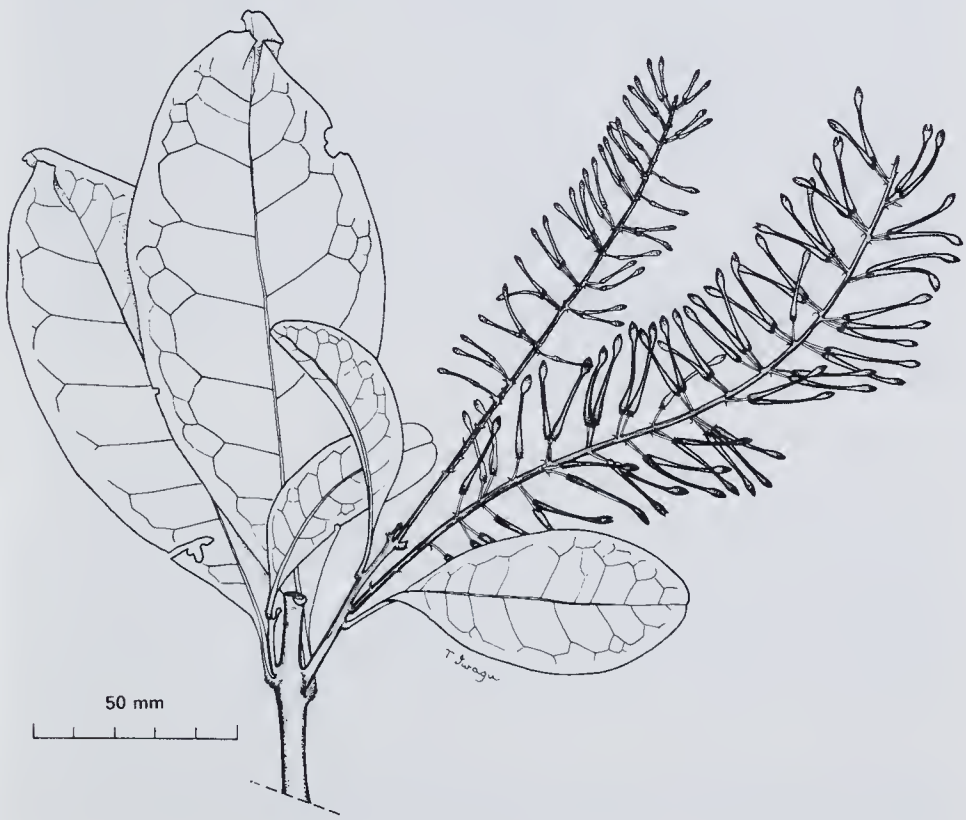

Fig. 4. *Helicia polyosmoides*. Flowering branchlet. From the type collection.

DISCUSSION:

In fruit *H. polyosmoides* shows a remarkable resemblance to a common species of *Polyosma* (Escalloniaceae) on Manus Island, hence the specific epithet. The two species are often found growing under similar ecological conditions.

Of the *Helicia* species occurring in the Bismark Archipelago *H. polyosmoides* is apparently most closely related to *H. hypoglauca* Diels, a widespread species which is also found on the main island of New Guinea. *H. polyosmoides* differs from *H. hypoglauca* in having longer and wider leaves which are glabrous and have more prominent venation. The flowers and fruits of both species are quite similar, the flowers of *H. polyosmoides* being slightly longer and glabrous.

Helicia retusa D. Foreman, sp.nov.

Arbor 3-8 m alta. *Ramuli* teretes, ad apices ferruginoso-tomentosi, glabrescentes. *Folii lamina* elliptica, retusa, ad basin breviter attenuata, integra, 6-9 cm longa, 2.5-5 cm lata, supra ferruginoso-tomentosa, glabrescens, infra rufo- vel atro-ferruginoso-tomentosa, glabrescens, coriacea; nervorum 5-7 pares; petiolus 1-1.5 cm longus, gracilis, ferruginoso-tomentosus, glabrescens. *Inflorescentia* ramiflora, 6-8.5 cm longa, ferruginoso-tomentosa. *Pedicelli* 2.5 mm longi, ferruginoso-tomentosi. *Perianthium* 2-2.5 cm longum, laxe ferruginoso-tomentosum. *Ovarium* glabrum. *Fructus* ± globosus, acutus, ad basin breviter attenuatus, 5 x 3.5 cm, purpureus, glaucus; pericarpium laeve, strato exteriori coriaceo ad carnosum, 2 mm crasso, interiori fibroso, 3 mm crasso; pedicellus crassus, 5 x 4 mm. *Semen* ovoideum, 3.5 x 2.5 cm.

Tree 3-8 m tall. *Branchlets* terete, ferruginous-tomentose towards the tip, glabrescent and grey lower down. *Leaf blade* elliptic, retuse, shortly attenuate at the base, entire, 4-9 cm long, 2.5-5 cm wide, coriaceous, the upper surface at first ferruginous-tomentose but becoming ± glabrous between the nerves with some hairs persisting along the midrib, the lower surface rufous or dark ferruginous-tomentose, becoming ± glabrous with a few hairs persisting along the midrib and main veins, the blade drying ± olivaceous above, light- to mid-brown beneath; midrib slightly raised above, very prominent beneath; nerves 5-7 pairs, flattened to slightly raised above, raised and prominent beneath, curved upwardly, interarching near the margin; reticulations dense, impressed above, slightly raised beneath; petiole 1.0-1.5 cm long, slender, ferruginous-tomentose at first, becoming glabrous. *Inflorescence* ramiflorous, 6-8.5 cm long, ferruginous-tomentose; rachis 2.5 mm diam. *Bract* subtending flower pairs ferruginous tomentose, acuminate, about 2 mm long; floral bracts ± similar. *Peduncle* 0.5 mm long, ferruginous-tomentose. *Pedicels* 2.5 mm long, ferruginous-tomentose. *Perianth* 2-2.5 cm long, laxly ferruginous-tomentose; limb 3 x 1.5 mm. *Anthers* 2.5 mm long. *Hypogynous glands* connate into a low crenulate cup. *Ovary* glabrous; style glabrous, yellowish. *Fruit* ± globose, 5.0 x 3.5 cm, ± pointed, shortly attenuate at the base, purple with a whitish bloom; pericarp smooth, outer zone coriaceous to fleshy, 2 mm thick, inner zone of fibres, 3 mm thick. *Seed* ovoid, 3.5 x 2.5 cm. *Fruit pedicel* stout, 5 x 4 mm. (Fig.5).

TYPE COLLECTION:

Mt Duau, above Agaun, Milne Bay district, Papua, 1.ii.1973, *P. F. Stevens LAE 58130* (flowering and fruiting collection). (Holotype: LAE. Isotypes: BRI, L).

FURTHER SPECIMEN EXAMINED:

Papua. Milne Bay district — Ridge between Mayu and Punpuniwa Rivers, Mt Suckling complex, 10.vi.1972, *P. Stevens & J. Veldkamp LAE 54001* (A, BRI, CANB, K, L, LAE).

DISTRIBUTION AND HABITAT:

Known only from the vicinity of the Mt. Suckling complex in the Milne Bay district of Papua. Occurs in open ridge forest at altitudes of 1600-1860 m.

DISCUSSION:

Apart from *H. retusa* the only other *Helicia* species in Papua New Guinea which consistently has a retuse leaf apex is *H. retevenia* Sleum. which is known only from the flowering type collection made near Mt Victoria several hundred kilometres to the northwest of Mt Suckling. The lack of fruiting collections of *H. retevenia* makes it difficult to assess the relationship between these two species. *H. retusa* is readily distinguished from *H.*

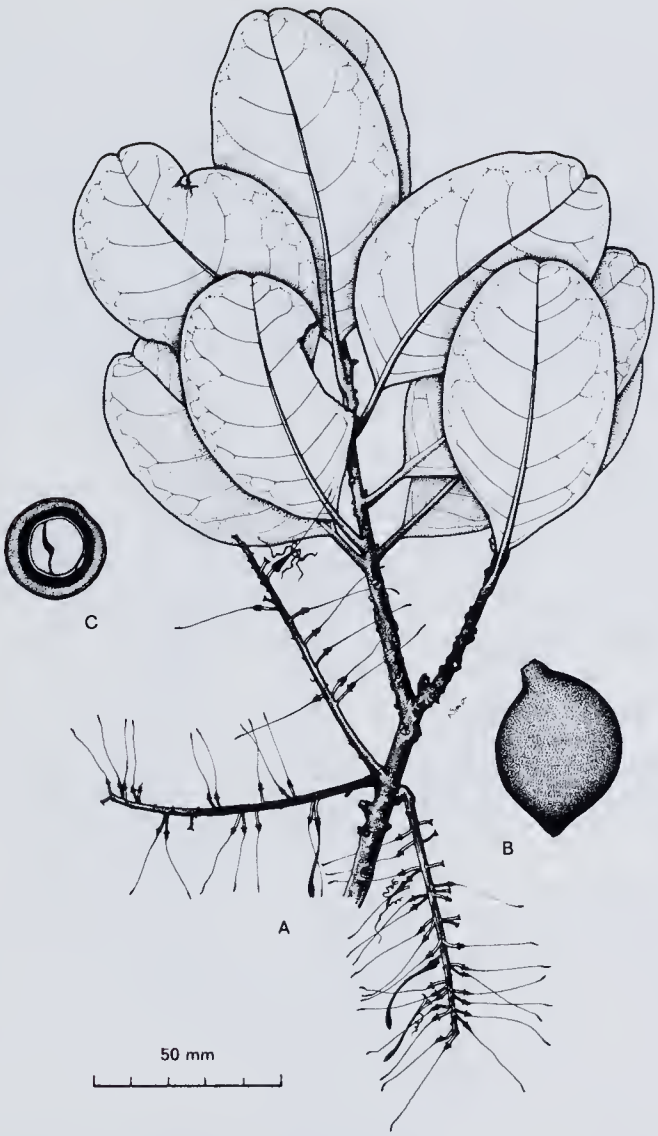

Fig. 5. *Helicia retusa*. A — flowering branchlet. B — mature fruit. C — cross-section through a mature fruit showing the seed. From the type collection.

retevenia as the former species has longer petioles, elliptic rather than obovate-oblong leaf blades, much longer flowers and usually some hairs persisting on the leaf undersurface.

A comparison of flower and fruit characters indicates that *H. retusa* is closely related to *H. albiflora* Sleum., a species which is widespread throughout the Morobe, Eastern Highlands and Western Highlands district of northeastern New Guinea and the Central and Northern districts of Papua. The leaves of *H. retusa* differ from those of *H. albiflora* by having shorter narrower blades and shorter petioles.

Helicia rostrata D. Foreman, sp.nov.

Arbor parva, 1-5 m alta. *Ramuli* teretes, graciles, ad apices rufo-tomentosi, glabrescentes. *Folii lamina* lanceolata, rostrata, ad basin attenuata, serrata, 3.5-5.5 cm longa, 0.9-1.5 cm lata, supra glabra, infra parce ferruginoso-tomentosa ad fere glabram, chartacea; nervorum 7-9 pares; petiolus 1-4 mm longus,

laxe rufo-tomentosa. *Inflorescentia* axillaris, 4-6 cm longa, laxe rufo-tomentosa. *Pedicelli* 2-2.5 mm longi, rufo-tomentosi. *Perianthium* 8-10 mm longum, brunneo-album, ± glabrum. Ovarium rufo-tomentosum. *Fructus* ignotus.

Small tree 1-5 m tall. *Branchlets* terete, slender, rufous-tomentose towards the tips, glabrescent lower down. *Leaf blade* lanceolate, rostrate, attenuate at the base, serrate, 3.5-5.5 cm long, 0.9-1.5 cm wide, chartaceous, glabrous above, sparsely ferruginous-tomentose to almost glabrous beneath, drying light green or light brown on both surfaces; midrib sunken above, ± raised and prominent beneath; nerves 7-9 pairs, slightly raised on both surfaces, ± straight in the lower two-thirds, curved upwardly and interarching near the margin; reticulations dense and well defined on both surfaces; petiole 1-4 mm long, sparsely rufous-tomentose, base slightly swollen. *Inflorescence* axillary, 4-6 cm long, sparsely rufous-tomentose; rachis 0.6 mm diam. *Bract* subtending flower pairs ovate-acute, rufous-tomentose, floral bracts ± similar. *Peduncle* 0.5 mm long, rufous-tomentose. *Pedicels* 2-2.5 mm long, rufous-tomentose. *Perianth* brownish-white, 8-10 mm long, ± glabrous, very sparsely ferruginous- to rufous-tomentose; limb 3 x 1.4 mm. *Anthers* c. 2 mm long. *Hypogynous glands* free, ± rounded. *Ovary* rufous-tomentose; style filiform, glabrous. Fruit not known. (Fig.6).

Fig. 6. *Helicia rostrata*. A — flowering branchlet. b — a pair of flowers with the perianth parts removed. From the type collection.

TYPE COLLECTION:

Maneau Range, north slopes of Mt Dayman, Milne Bay district, Papua, 7.vi.1953, *L.J. Brass 22820* (flowering collection). (Holotype: LAE. Isotype: A).

FURTHER SPECIMEN EXAMINED:

Papua. Milne Bay district — Maneau Range, Mt Dayman, 30.v.1953, *L. J. Brass 22682*(A).

DISTRIBUTION AND HABITAT:

H. rostrata apparently has a localized distribution, being represented only by the two cited collections from Mt Dayman in the Milne Bay district of Papua collected by L. J. Brass in 1953. The species was not located on a more recent expedition in 1972 to the nearby Mt Suckling complex about 50 kilometres north-west of Mt Dayman (Stevens, 1972 pers.comm.). Likewise there are no known specimens of *H. rostrata* from Mt Simpson, about 35 km to the south-east of the Mt Suckling complex, although this mountain is not well known botanically.

H. rostrata occurs in *Nothofagus* forest on ridge crests and in the understorey of mossy forest, at altitudes from 2050-2200 m.

DISCUSSION:

In habit, most floral characters and some leaf characters, *H. rostrata* closely resembles *H. microneura* C.T. White which is relatively widespread and has been collected from the Mt Suckling region. This similarity is interesting because of the resemblance between *H. microneura* and the widespread Australian species *H. glabriflora* F. Muell. Although the perianth of *H. microneura* is much shorter than that of *H. glabrifolia* the fruits of the two species are ± identical and the leaves are similar in many characters. Unfortunately the fruits of *H. rostrata* are unknown so a complete comparison of these three species is not yet possible.

Helicia subcordata D. Foreman, sp. nov.

Arbor 24 m alta. *Ramuli* teretes, crassi, glabri. *Folii lamina* obovata ad parum panduratam, ad apicem rotundata, ad basin subcordata, integra, 24.5-33.5 cm longa, c. 11 cm lata, glabra, coriacea; nervorum c. 17 pares; petiolus crassus, rugosus, 6-10 x 7-8 mm. *Inflorescentia* ramiflora, 10-16 cm longa, glabra. *Pedicelli* graciles, c. 7-8 mm longi, glabri. *Perianthium* 2.8-3.2 cm longum, cremeo-alba, glabrum. *Ovarium* glabrum; pollinis praebitor caeruleus. *Fructus* ignotus.

Tree 24 m tall. *Branchlets* terete, stout, glabrous. *Leaf blade* obovate to slightly panduriate, rounded at the tip, subcordate, entire, 24.5-33.5 cm long, c. 11 cm wide, coriaceous, glabrous, drying olivaceous above, light-brown beneath, and shiny on both surfaces; midrib slightly raised above, raised and prominent beneath; nerves about 17 pairs, ± flattened above, raised and prominent beneath, curved upwardly and interarching near the margin; reticulations dense, slightly raised on both surfaces; petiole stout and rugose, 6-10 x 7-8 mm. *Inflorescence* ramiflorous, 10-16 cm long, glabrous; rachis 2 mm diam. *Bract* subtending flower pairs ovate-acute, about 1 mm long, glabrous; floral bracts ± similar. *Peduncle* 1-2 mm long, glabrous. *Pedicels* slender, c. 7-8 mm long, glabrous. *Perianth* creamish-white, 2.8-3.2 cm long, glabrous; limb 5-6 x 1.5 mm. *Anthers* c. 4 mm long. *Hypogynous glands* free, broadly rounded. *Ovary* glabrous; style slender, glabrous; pollen presenter bright blue. *Fruit* not known. (Fig. 7).

TYPE COLLECTION:

Near Wagau, Morobe district, northeastern New Guinea, 3.xi.1963, *J. S. Womersley NGF 17903* (flowering collection). (Holotype: LAE. Isotypes: A, BRI, CANB, L, NSW).

DISTRIBUTION AND HABITAT:

Known only from the type collection. Occurs in open, mid-montane forest at an altitude of 1370 m.

DISCUSSION:

H. subcordata can be distinguished immediately from all other New Guinea species by the subcordate leaf base.

Fig. 7. *Helicia subcordata*. A — leafy branchlet. B — inflorescence with most of the flowers after anthesis; a few mature buds are also present. From the type collection.

In flower colour and size *H. subcordata* resembles the relatively common, widespread and somewhat variable *H. forbesiana* F. Muell. The flowers and the inflorescences of *H. subcordata* differ from those of *H. forbesiana* in being completely glabrous rather than sparsely rufous-tomentose. The pedicels of *H. subcordata* also tend to be slightly longer and are more slender than those of *H. forbesiana*. Some specimens of *H. forbesiana* have leaves which are ± similar in size and shape (although lacking the subcordate base) to those of *H. subcordata* and the petioles of *H. forbesiana* tend to be longer and less rugose. Unfortunately the fruit of *H. subcordata* is not known.

ACKNOWLEDGEMENTS

I wish to thank the Assistant Director at LAE for kindly sending herbarium material on loan. Thanks are also due to Dr P. F. Stevens, formerly of the Division of Botany, LAE, now at the Arnold Arboretum (A), for information regarding the species occurring on the Mt Suckling complex. Mr Alex George kindly prepared the latin diagnoses and for this help I am very grateful. Mr T. Nolan and Mr T. Iwagu prepared the drawings.

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TWO NEW LICHENS: CLADONIA BIMBERIENSIS AND C. WEYMOUTHII

by

Alan W. Archer *

ABSTRACT

Archer, Alan W. Two new lichens: *Cladonia bimberiensis* and *C. weymouthii*. *Muelleria* 6(1): 93-95 (1985). — Two new lichen species, *Cladonia bimberiensis* and *C. weymouthii*, are described and discussed. Both occur in Australia and New Zealand.

TAXONOMY

For the chemical work involved, acetone extracts from specimens were examined by thin-layer chromatography, using the mobile phases described by Culberson (Culberson, 1972) and the separated compounds were detected with sulphuric acid (Culberson, 1972) and MBTH (Archer, 1978).

Cladonia bimberiensis A. W. Archer, sp. nov.

Thallus primarius squamulis parvis, supra flavo-virentibus, infra albis, nullis sorediis, marginibus crenatis. *Podetia* squamulis enata, 10-25 mm altis, flavida, subcylindrica, simplicia vel scyphis angustis vel scyphis deformibus prolificationibus marginalibus; podetia cortice aspero prope basin, ecorticatescens et sorediis farinosis. *Apothecia* non visa. *Pycnidia* fusca terminalia, vel marginalia scyphis. *Thallus* K−; KC + flavidus; Pd −; acida usnicum et barbaticum continens. Habitat ligno.

Basal squamules persistent, small, 0.5-1.0 mm long, 0.3-0.5 mm wide, esorediate, yellow-green above, white below; margins crenate. *Podetia* growing from the basal squamules, 10-25(-35) mm tall, 0.7-2.0 mm diam., pale yellow, more or less cylindrical, simple and escyphose, or with shallow, deformed scyphi with marginal proliferations; podetia rough corticate at the base and then becoming ecorticate and densely farinose sorediate, with the interior of the scyphi farinose sorediate; esquamulose or occasionally with squamules on the lower part of the podetia; podetial wall 0.15-0.2 mm thick. *Apothecia* not seen; pycnidia brown, 0.1-0.2 mm diam., 0.3-0.4 mm long, terminal or marginal on the scyphi; pycnidiospores not seen. *Thallus* K−; KC + yellow; Pd −; containing usnic, barbatic and 4-0-demethyl barbatic acids.

Type Collection:

Australia, Australian Capital Territory, Mt. Bimberi, Bimberi Range, 49 km SW of Canberra, 35° 40'S, 148°48'E, alt. 1700 m, on decayed log, 11.xii.1979, *H. Streimann 9743* (Holotype: CBG; Isotype: H, US, TNS).

Also Examined:

Australia. Australian Capital Territory — 1 km SE. of Bimberi Peak, Bimberi Range, alt. 1820 m, 11.xii.1979, *J.A. Elix 6640* (ANU, MEL 1047742); ibidem, *J.A. Elix 6639* (NSW).

New Zealand. South Island — Nelson Province, Red Hill Range, Richmond Forest Park, 41°09'S, alt. 1700 m, 28.xii.1980, *J. K. Bartlett 19807* (herb. J. K. Bartlett, Auckland).

Discussion:

Cladonia bimberiensis is known from only two areas, one in Australia and the other in New Zealand. Both areas are sub-alpine at altitudes of 1700 m or above and in each the preferred substrate of the species was dead wood.

C. bimberiensis is related, both chemically and morphologically, to the two northern hemisphere circumpolar species *C. cyanipes* (Sommerf.) Nyl. and *C. bacilliformis* (Nyl.) Glück, each of which possesses sorediate podetia and contains usnic and barbatic acids. The simple, pale yellow, somewhat scyphose podetia of *C. bimberiensis* distinguish this species from *C. cyanipes* which has grey, branched podetia lacking scyphi, and from *C. bacilliformis* which has shorter, thicker, rarely scyphose podetia with pale brown apothecia. *C. bimberiensis* is also distinguished from the somewhat similar Hawaiian species, *C. angustata* Nyl., by the absence of didymic acid and red apothecia, both of which are present in the latter species.

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C. bimberiensis is the only member of the genus *Cladonia* in Australia to contain both usnic and barbatic acids. *C. coccifera* (L.) Willd., a corticate species with well-defined scyphi and containing usnic and barbatic acids, was reported from Australia in the nineteenth century but it has not been found by the author. Australasian specimens labelled *C. coccifera* in herbaria are referrable to other species, particularly *C. pleurota* (Flörke) Schaerer or *C. subdigitata* Nyl. *C. bimberiensis* belongs to the infra-generic group Ochroleucae (Houvinen and Ahti, 1982).

The specific epithet "bimberiensis" refers to Mt Bimberi, Australian Capital Territory, where the first specimens were collected.

Cladonia weymouthii F. Wilson ex A. W. Archer, sp. nov.

Thallus primarius squamulis parvis, supra virellis, infra albis, nullis sorediis, marginibus crenatis. *Podetia* squamulis enata, 15-55 mm altis, virella, simplicia vel ramosescentia ad apicem; cortice aspero prope basin, ecorticatescens et sorediis farinosis. *Apothecia* coccinea; *pycnidia* fusca, terminalia. *Thallus* K+ flavus; KC−; Pd+ flavus; acida thamnolicum, barbaticum et didymicum continens. Habitat ligno et humo.

Basal squamules inconspicuous, persistent, small, 0.5-1 x 1-2 mm, incised, esorediate, green above, white below; margins crenate. *Podetia* growing from the basal squamules, (15-)20-40(-55) mm tall, 1-2.5(-4) mm diam., green to greenish-grey, subcylindrical or tapering to the apices, simple or branching somewhat near the tips, the branching forming deformed scyphi, lacking well-defined scyphi, axils closed; podetia corticate at the base and below the apothecia, the remainder of the podetia ecorticate and densely farinose sorediate; podetia esquamulose or with squamules on the lower part; podetial wall 0.25-0.3 mm thick. *Apothecia* rare, terminal, red, convex, 1-3 mm diam., ascospores eight per ascus, 12-15 μm long, 3-4 μm wide, ellipsoid, colourless, simple; pycnidia terminal on the podetia, red, becoming dark brown to black in old specimens; pycnidiospores not seen. *Thallus* K + yellow; KC−; Pd + yellow; containing barbatic, thamnolic and didymic acids.

Type Collection:

Australia, Tasmania, Huon River, 5.ii.1892, *W. A. Weymouth* (Holotype: MEL 6760; Isotype: NSW).

Also Examined:

Australia. Tasmania (selected specimens only, 5/20) — Price's Rivulet, Huon, ü.1902, *W. A. Weymouth* (NSW); near Hastings Cave, 12 km WNW. of Southport, 43°23'S, 146°50'E, alt. 250 m, 27.xi.1982, *Archer 1417D* (H, MEL 1045447); 15 km W. of Maydena, 42°45'S, 146°30'E, alt. c. 400 m, 7.xii.1983, *Archer 1545A* (CBG, NSW); Pencil Pine Creek, 100 km W. of Launceston, 41°35'S, 145°55'E, alt. 800 m, 29.xi.1983, *Archer 1566A* (MEL 1045448); the Hermit, 8 km SE. of Strathgordon, 42°49'S, 146°08'E, alt. 500 m, 19.i.1984, *G. Kantvilas 59/84* (NSW).

New Zealand. North Island — Hihitahi State Forest, 39°30'S, 175°30'E, alt. 970 m, *J. K. Bartlett 27049. South Island* — Mt Cassidy, Arthur's Pass National Park, 43°S, alt. 1800 m, 15.xii.1978, *J. K. Bartlett 21387;* Nelson Province, Hay Paddock, Mt Owen, 41°31'S, alt. 1550 m, —.i.1983, *J. K. Bartlett 21589.* (New Zealand specimens in herb. J. K. Bartlett, Auckland).

Discussion:

Cladonia weymouthii is known only from Tasmania and New Zealand. It occurs between latitudes 39° and 44°S and at altitudes from 250 m to 1800 m and grows on dead wood or on soil containing fragments of dead wood. Apothecia are rare and were seen in only one specimen from the Cradle Mountain region, Tasmania (Archer 1566A). Sterile podetia are sorediate to the tips but fertile podetia become corticate just below the apothecia.

C. weymouthii is morphologically similar to *C. bacillaris* Nyl. but is distinguished from that species by the presence of branched and partly corticate podetia and of thamnolic acid. It is separated from *C. macilenta* Hoffm. by the occasionally deformed scyphi and the tall, branched, partly corticate podetia. The farinose sorediate podetia of *C. weymouthii* are somewhat similar to those of *C. corniculata* Ahti & Kashiwadani but the latter species, lacking thamnolic acid, gives no yellow colour with alkali. *C. weymouthii* belongs to the infra-generic group Cocciferae (Houvinen and Ahti, 1982).

The epithet "weymouthii" was used by F. R. M. Wilson as a manuscript name on specimens collected in Tasmania by W. A. Weymouth in 1892 at "Huon River". The exact

location is not known but was possibly near the present town of Huonville, on the Huon River, 43°02'S, 147°04'E.

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VEGETATION OF SOUTH AND CENTRAL GIPPSLAND

by

P.K. Gullan, S.J. Forbes, G.E. Earl, R.H. Barley and N.G. Walsh *

ABSTRACT

Gullan, P.K., Forbes, S.J., Earl, G.E., Barley, R.H. & Walsh, N.G. Vegetation of South and Central Gippsland. *Muelleria* 6 (2):97-145 (1985). — Areas of South and Central Gippsland, Victoria, were surveyed between 1979 and 1983 using a floristics-based, quadrat-sampling technique. The data from 246 quadrat sites of these surveys plus 623 quadrat sites from surveys carried out by others between 1972 and 1981 were analysed using a computer-based, numerical sorting and classification procedure to determine the major floristic vegetation types of the area. These were then arranged hierarchically into 20 floristic *communities*, each with one or more distinct floristic *sub-communities*.

Communities defined in this paper include alpine heaths, wet mountain forests in the north and central highlands of the area, grassy woodlands, heathy woodlands and open forests of the inland and near-coastal lowlands, and salt marsh and mangrove of the coast.

INTRODUCTION

This paper presents the results of a floristic vegetation survey of Central Gippsland and part of South Gippsland. Its purpose is to define and describe the major floristic vegetation communities of the area and give an indication of their geographical and environmental ranges.

The results incorporate data from 246 quadrat sites examined between 1979 and 1983 by a team from the National Herbarium of Victoria and from 623 quadrat sites examined by others between 1972 and 1981 (see Data Collection).

THE STUDY AREA

The study area is approximately 9000 km^2 and includes the shires of Narracan, Warragul, Morwell, Rosedale, Mirboo, Alberton and part of South Gippsland (Fig. 1). It encompasses the catchments of the Albert and Tarra Rivers, Bruthen and Merriman Creeks and most of the Latrobe River and its tributaries (e.g. the Thomson, Tyers, Tanjil and Morwell Rivers). The highest point in the area is 1560 m at Mt St Phillack on the Baw Baw Plateau and the lowest elevation is sea-level at Corner Inlet to the south (Fig. 2). Precipitation varies from below 700 mm per annum in the east to above 1400 mm per annum on the Baw Baw Plateau, where some falls as snow (Fig. 3).

Fig. 1. Location of the Study Area in Victoria.

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

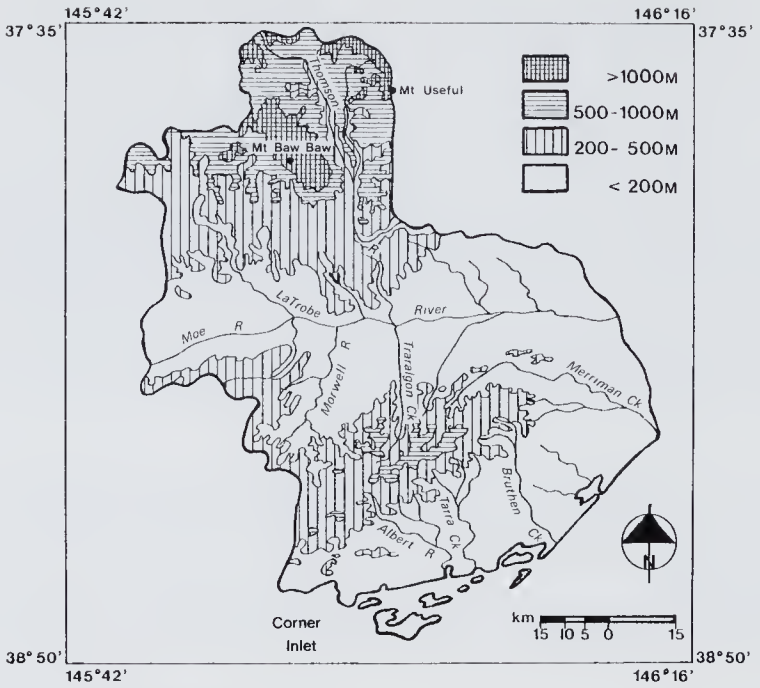


Fig. 2. Study Area showing topography and rivers.

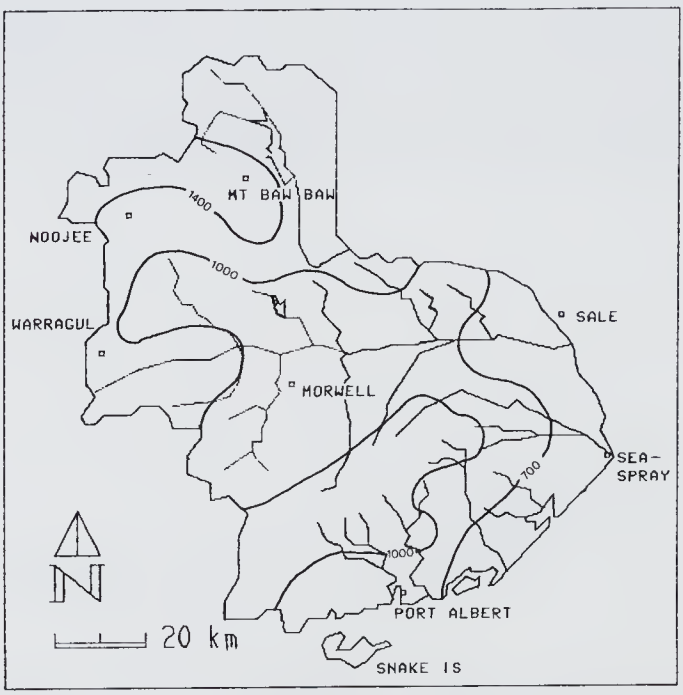


Fig. 3. Study Area showing localities and mean annual rainfall in mm.

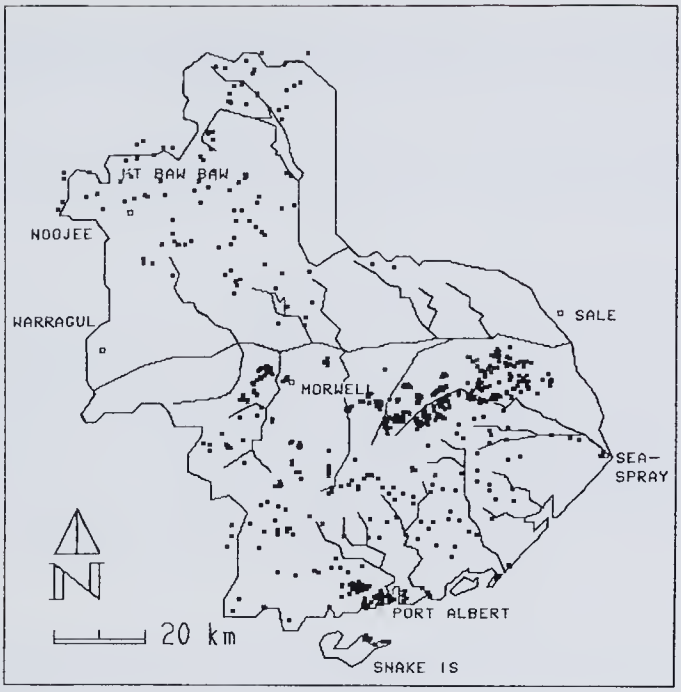


Fig. 4. Study Area showing all quadrat sites.

THE SURVEY

Method

DATA COLLECTION

Floristic and structural data were available from 901 quadrats, 869 of which were used in the analysis (32 sites from different surveys had inadequate locality information for use in sub-community descriptions). These quadrats were from the sources outlined below and were chosen to represent examples of all major stands of vegetation within the study area (Fig. 4).

246 *quadrats:* Field surveys by the National Herbarium survey team in 1979, 1981 and 1983, quadrat numbers beginning with 08, 09, 10, 28 and 40.

275 *quadrats:* Unpublished Ph.D. Thesis and field notes of G.C. Suckling, Monash University, quadrat numbers beginning with 26 (Suckling 1980, and associated raw data).

120 *quadrats:* Field survey by G.W. Carr working for Kinhill Planners Pty. Ltd., quadrat numbers beginning with 22 and 25 (Carr 1981, and associated raw data).

84 *quadrats:* Field survey of the Holey Plains National Park by G.A. Parr-Smith, Victorian National Parks Authority, quadrat numbers beginning with 23 (Parr-Smith 1978, and associated raw data).

76 *quadrats:* Field survey by N.H. Scarlett, Melbourne University, quadrats 27007-27082 (unpublished data collected 1973).

57 *quadrats:* Field survey of Gellions Run by A.R.G. McMahon, Land Conservation Council, Victoria, quadrat numbers beginning with 24 (McMahon 1981, and associated raw data).

6 *quadrats:* Field survey of Tarra Valley and Bulga National Parks by J.R. Busby, Monash University, quadrats 27001-27006 (unpublished data collected 1972).

5 *quadrats:* Field survey of Baw Baw Reference Area by D. Cheal, Victorian National Parks Authority (1982), quadrats 40009-40013.

The format and quality of data from these sources varied but all included a list of all vascular plant species from a quadrat site which was considered to be representative of the native vegetation of the area. At each quadrat site the performance of each species was visually assessed and assigned a numerical value on the Braun-Blanquet scale (see Gullan 1978).

A structural description of the vegetation at each quadrat was also made and was later standardized (by the authors of this report) to conform with the system of Specht (1970).

Each quadrat was located on a 1:100,000 scale topographic map and from this the altitude, latitude and longitude were determined.

Plant Identification

Nomenclature follows that of Forbes et al. (1984).

In most cases where plants could not be identified in the field, specimens were collected and later checked against a reference collection (usually that of the National Herbarium). Where identification to species level was not possible, or beyond the capabilities of the worker, nomenclature was taken to a higher taxonomic level (e.g. *Juncus* spp., Gramineae sp.).

The following is a list of those taxa in which nomenclature qualifications need to be made as a result of difficulties with identifications or changes in classification of some plant groups subsequent to the original data collection.

Amyema pendulum, A. miquelii—because of the difficulties in collecting these arboreal parasites and their superficial vegetative similarity, all specimens have been recorded as *A. pendulum*, the commoner species.

Cassinia aculeata, C. longifolia, C. trinerva—may not have been correctly identified at times due to the unavailability of suitable field key (e.g. Willis 1973) at the time of sampling for some of the workers. Recent field studies suggest that *C. trinerva* is more common than the data in this report suggest.

Casuarina paludosa, C. pusilla—lines of demarcation between these taxonomically complex species are often unclear. Intermediate specimens have been referred to *C. paludosa*, the commonest species in eastern Victoria.

Centaurium erythraea, C. tenuiflorum—distinction between these species is complicated by the broad overlap in floral and vegetative characteristics. In the absence of adequate flowering material specimens have been recorded as *C. tenuiflorum*.

Chiloglottis spp.—non-flowering individuals of this genus are almost indistinguishable and in such cases the commonest species *C. gunnii* has been recorded.

Craspedia glauca, Craspedia sp. D—lowland individuals of this species complex were recorded as *C. glauca* whereas alpine specimens have been identified with reference to the arrangement of Costin *et al.* (1981).

Erigeron pappochromus, Erigeron spp. A,B,C—the same procedure as that used on *Craspedia* was adopted.

Eucalyptus viminalis—No distinction was made between the riparian and near-coastal ecotypes of this species (regarded by some authors as distinct species) as intergradation between forms was almost complete within the study area.

Geranium potentilloides, G. retrorsum, G. solanderi—these species are virtually indistinguishable in the vegetative state and, when no flowering material was available, specimens were referred to the commonest species, *G. potentilloides*.

Juncus spp. Section *Genuini*—due to the unavailability of diagnosis for all species within this taxonomically difficult group (particularly for some of the earlier workers) specimens may not have been identified beyond *Juncus* spp.

Luzula campestris sp. agg.—most specimens of *Luzula* were lumped into the species aggregate, however 18 specimens were identified with reference to Edgar (1975).

Poa australis sp. agg.—J.W. Vickery's taxonomic study of *Poa* was published in 1970. This revision has gained varied acceptance amongst field botanists and few of the species in this aggregate have been identified further than *P. australis*. However, some of the more recent data from the high country and the lowlands near Driffield incorporates identification to species level.

Rubus fruticosus sp. agg.—about 15% of the specimens have been identified with reference to Amor and Miles (1974). The remainder have been retained as *R. fruticosus* sp. agg., either because of the unavailability of suitable material or because of individual contributor's non-acceptance of this revision.

Senecio spp. *(Erechtites* group)—when young or infertile, members of this group are often indistinguishable. In such cases specimens have been labelled *Senecio* spp.

Data Storage and Analysis

Information from each quadrat site (floristics, locality, altitude and sampling date) was stored on magnetic disk. Analyses were in the form of a computer-based, numerical classification procedure coupled with a hand-sorting procedure of the type outlined in Gullan (1978). The final result of this analysis is a two-way table which holds all of the raw data in a sorted form. However, because most species occur in less than 10% of the quadrats and add little to the overall vegetation description, the two-way tables presented in this paper do not contain all the species recorded in each quadrat. For a full explanation of the two-way tables see Gullan *et al.* (1981).

Terminology

The terminology associated with the vegetation classification follows that of Gullan *et al.* (1981). The terms used are discussed briefly here.

Sub-community

A sub-community is a group of quadrats which have a similar floristic composition.

Community

A community is a collection of one or more sub-communities which have floristic and environmental affinities. The community may represent a floristic continuum along which arbitrary divisions have been made to form sub-communities. It may represent a collection of sub-communities which are considered to be different temporal phases of the same vegetation or a single vegetation under different disturbance regimes (e.g. fire, grazing, clearing).

Character Species

A character species is one which occurs frequently and consistently in the quadrats of a sub-community and is useful as an indicator of that sub-community. For a full discussion of this term and its numerical calculation see Gullan *et al.* (1981).

Community Names

These are familiar and descriptive names (common names) applied to the communities and take into account common, although often imprecise, terminology (e.g. Wet Sclerophyll Forest). The naming system used here is described more fully in Gullan *et al.* (1981). Where appropriate the names of communities in this paper follow those of Gullan *et al.* (1981) and Forbes *et al.* (1982).

Limitations and Qualifications

Floristics

As each quadrat was sampled only once, some annual ephemeral species may have been missed at quadrat sites.

Distribution of Sub-communities

The distribution maps provided with the sub-community descriptions show sites where

a sub-community has been positively recorded. They are not exhaustive maps of each sub-community.

WEEDS

The mean weed composition of each sub-community has been determined in this paper. This is an indicator of weed invasion into native plant communities. It should not be interpreted as an indicator of the abundance of weeds in the entire study area.

RESULTS

The results of the survey and its analysis are presented in three different ways in order to provide easy access to any piece of information relevant to the aims of this paper.

Two-way Tables

The two-way tables (Tables 1-9) contain a succinct description of the floristic composition of the vegetation and are the most important source of information on floristic variation within and between different kinds of vegetation (see Gullan *et al.*, 1981).

Community Descriptions

Twenty communities have been described for the South and Central Gippsland study area. These represent the major extant vegetation types of the region. However the descriptions will not always reflect the floristic composition and natural distribution of these communities prior to European settlement. Since settlement large areas of native vegetation have been cleared for pasture and pine plantations *(Pinus radiata).*

Undoubtedly the Grassy Woodland community has suffered most from this disturbance. This is reflected by the abundance of introduced species in the community and by the fragmentation of its remnant stands. It is probable that some sub-communities of Grassy Woodland have been completely destroyed by extensive land clearance immediately north and south of the Princes Highway. One of these sub-communities may have been dominated by *Eucalyptus tereticornis* (Forest Red Gum), a species once widespread in the study area but now restricted to a few sites north of the Strzelecki Ranges on alienated land.

A brief description of each of the major communities in South and Central Gippsland (SCG) is given below.

SCG COMMUNITY 1: Alpine Wet Heath (Fig. 5a; 5 sites).

An open to closed-heath community confined to depressions and drainage basins of the Baw Baw Plateau. The vegetation varies in structure and floristic composition depending on the water content of the soil.

SCG COMMUNITY 2: Alpine Heath (Fig. 5b; 4 sites).

An open to closed-heath community found on exposed hillsides between the depressions supporting Alpine Wet Heath and the hills supporting Snow Gum Woodland on the Baw Baw Plateau. The species dominating this community are often those that are common in the understorey of Snow Gum Woodland (Walsh *et al.*, 1984).

SCG COMMUNITY 3: Snow Gum Woodland (Fig. 5c; 7 sites).

A woodland dominated by the small, often mallee-form tree, *Eucalyptus pauciflora.* The community is restricted to well-drained soils on hills and ridges of the Baw Baw Plateau and surrounds. The understorey is different from that of representatives of this community in other parts of Victoria, in the abundance of the shrubs *Pultenaea muelleri* and *Wittsteinia vacciniacea,* the latter being endemic to the plateau and a few nearby ridges and peaks.

SCG COMMUNITY 4: Subalpine Riparian Scrub (Fig. 5d; 6 sites).

A closed-scrub community of moist, protected gullies above 900 m in the region of the Baw Baw Plateau. *Nothofagus cunninghamii* (growing as a large dense shrub) and *Leptospermum grandifolium* usually dominate an understorey of shrubs sedges and herbs.

SCG Community 5: Montane Sclerophyll Woodland (Fig. 5e; 2 sub-communities; 16 sites).

A floristically-rich, sclerophyllous woodland of exposed, stoney slopes and ridges, usually above 700 m. The trees are often stunted *E. radiata, E. dives* and *E. cypellocarpa*. Understorey species include many Damp Sclerophyll Forest plants as well as species indicative of dry ridges.

SCG Community 6: Cool Temperate Rainforest (Fig. 5f; 2 sub-communities; 30 sites).

A closed-forest dominated by *Nothofagus cunninghamii* (as a tree to 25 m; cf. SCG Community 4) growing in deep, protected gullies particularly within the high-rainfall parts of the Strzelecki Ranges. The understorey is dominated by a range of tree-ferns which grow with a range of smaller ground and epiphytic ferns.

SCG Community 7: Wet Sclerophyll Forest (Fig. 5g; 58 sites).

A tall open-forest, usually dominated by *E. regnans* and growing on deep loamy soils of wetter mountain ranges at altitudes of 100 to 1000 m. Other major tree species of this forest include *E. obliqua, E. cypellocarpa* and *E. radiata* on more exposed sites, and *E. viminalis* on riparian sites.

SCG Community 8: Dry Sclerophyll Forest (Fig. 5h; 2 sub-communities; 19 sites).

An open-forest on loam to sandy-loam soils at altitudes of 80 to 200 m in the vicinity of the Holey Plains. The major tree species are *E. globoidea* and *E. consideniana* which dominate a very species-poor understorey supporting dense stands of *Pteridium esculentum, Gahnia radula* and *Leptospermum phylicoides*. The community has obviously suffered severe disturbance in the past and supports fewer species than it would have in pre-European times.

SCG Community 9: Damp Sclerophyll Forest (Fig. 6a; 9 sub-communities; 226 sites).

An open-forest to tall open-forest of loam soils at altitudes usually between 50 and 700 m. This is the most variable community in the study area both floristically and structurally. Since the destruction of most of the Wet Sclerophyll Forest, either through clearing by early settlers or burning in the 1939 fires, Damp Sclerophyll Forest has become the most heavily utilized community for timber production and allied forest products (e.g. woodchips).

SCG Community 10: *Leptospermum myrsinoides* Heathland (Fig. 6b; 3 sub-communities; 202 sites).

A woodland with a heathland understorey on sandy soils below 300 m. In more western areas (e.g. Mornington Peninsula, Lower Glenelg National Park) this community often exists without, or with only a sparse, tree cover. In the study area, however, the tree layer is usually well developed.

The understorey is always dominated by the dense shrub *Leptospermum myrsinoides* but the tree layer varies. In the south, *E. viminalis* (var. *pryoriana,* a stunted sometimes mallee-form ecotype) is the major tree species, in the central region (e.g. Mullungdung and Boodyarn Forests) *E. consideniana* and *E. radiata* are the commonest species and in the north-east (Holey Plains), *E. nitida* is the commonest species. In all regions *Banksia serrata* is abundant.

SCG Community 12: Grassy Woodland (Fig. 6c; 4 sub-communities; 110 sites).

An open-forest to woodland community found on flat to gently undulating, clay-loam soils at altitudes of 20 to 220 m. The main tree species, *E. radiata* and *E. viminalis,* dominate an understorey made up largely of grasses and other monocotyledons, and herbaceous dicotyledons. Shrubs are locally abundant but not usually dominant in the understorey.

Because of relatively flat terrain on which this community is found, small depressions may become seasonally waterlogged. In these depressions *E. ovata* is usually the dominant tree species and *Melaleuca ericifolia* Scrub can develop beneath it.

Grassy Woodland has been heavily utilized for grazing throughout its range in the study area. As a consequence it is the most fragmented and weedy of the communities in the region.

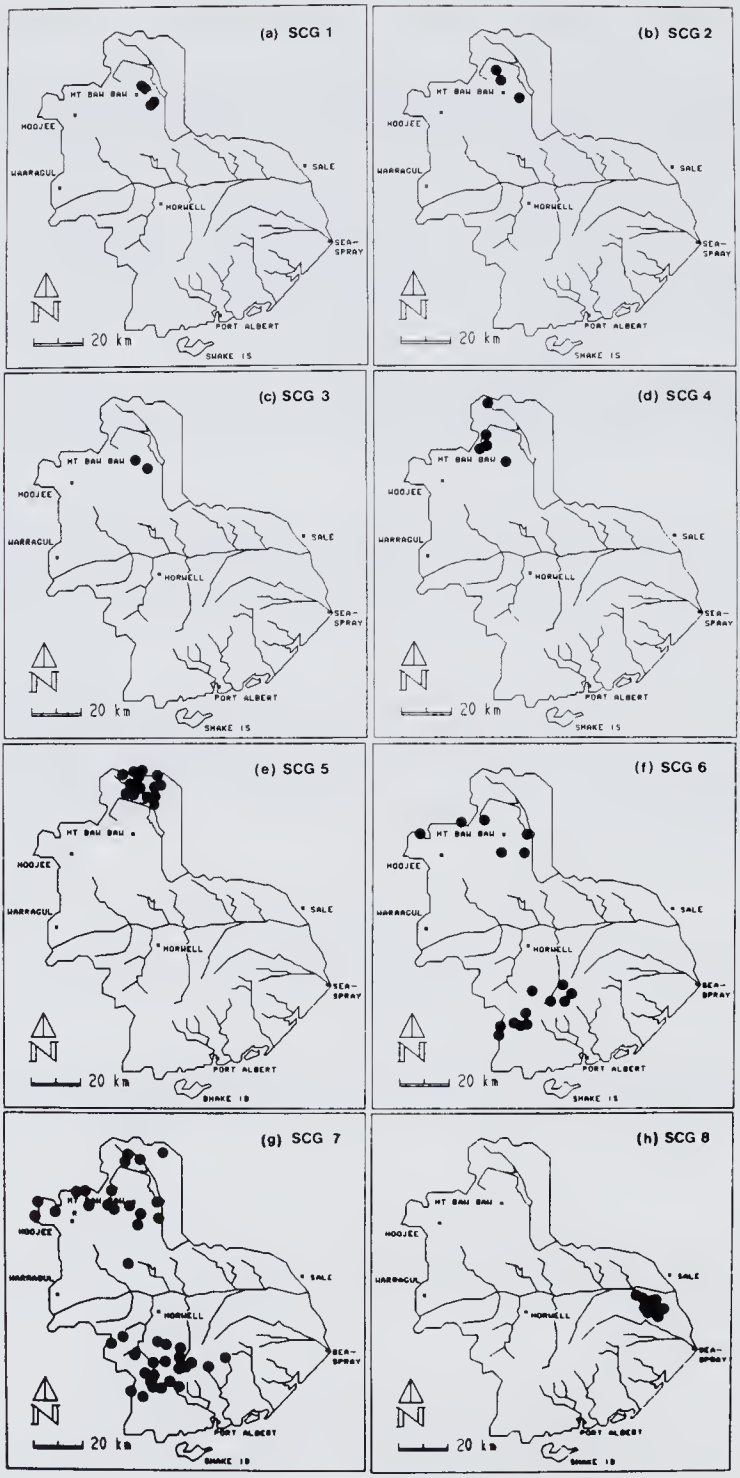


Fig. 5. Distribution maps for communities 1-8.

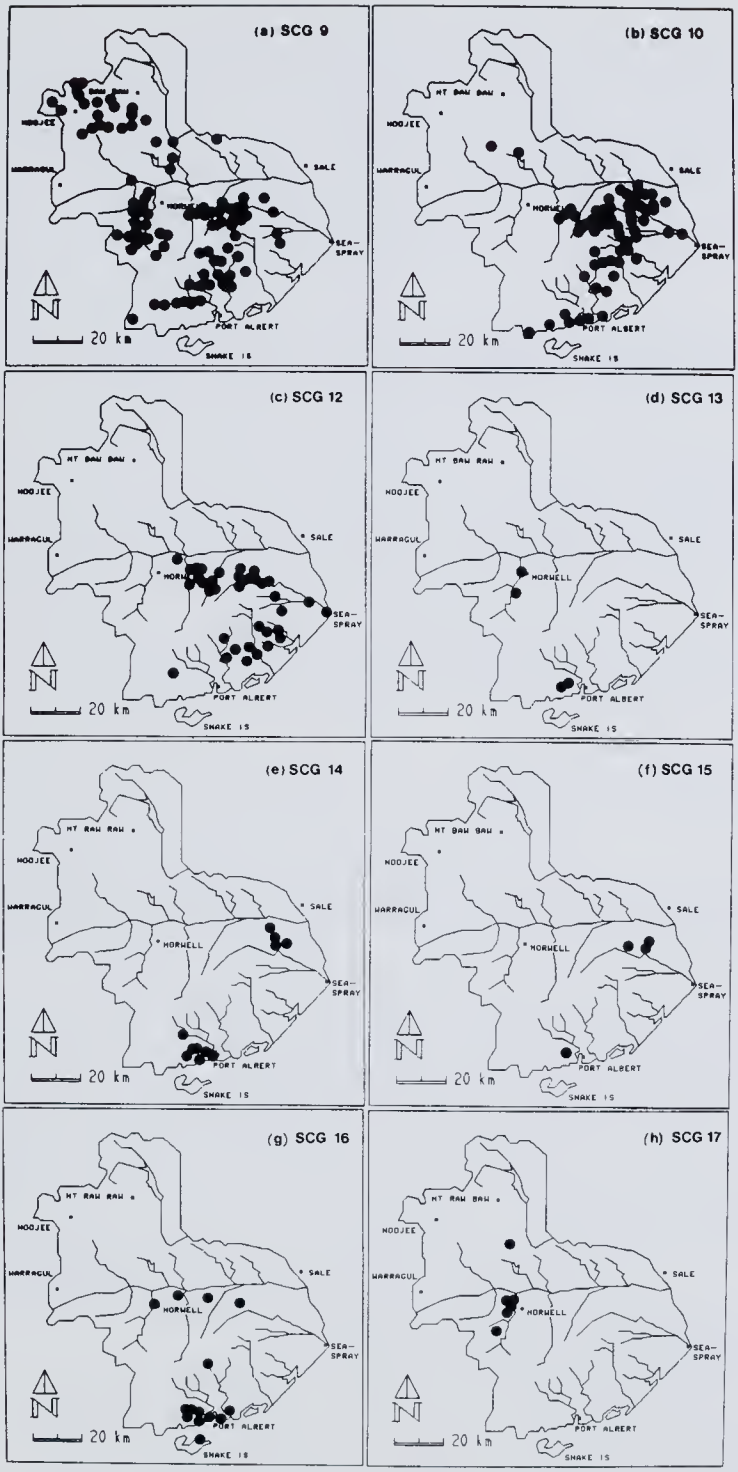


Fig. 6. Distribution maps for communities 9, 10 and 12-17.

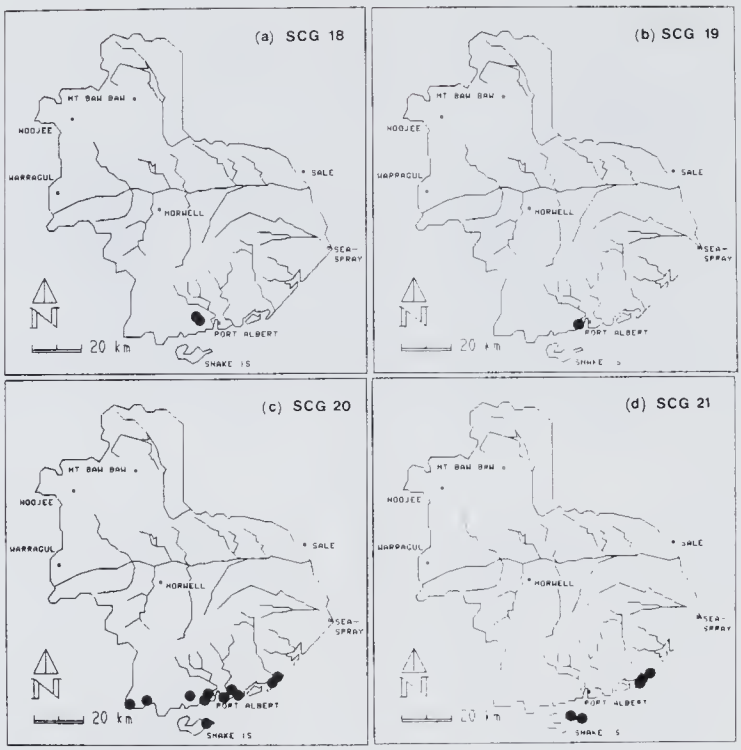


Fig. 7. Distribution maps for communities 18-21.

SCG Community 13: Freshwater Marsh (Fig. 6d; 2 sub-communities; 5 sites).
Aquatic vegetation in pools of standing water on lowland farming areas. Plants include those that are floating on the water surface (e.g. *Lemna minor*) and those that are rooted in the substrate (e.g. *Potamogeton* spp., *Triglochin procera).*

SCG Community 14: Coastal Heathland (Fig. 6e; 2 sub-communities; 20 sites).
A closed-heath to open-woodland on poorly drained, sandy soils, principally of near-coastal regions. The dominant species of the community are *Melaleuca squarrosa, Leptospermum myrsinoides,* and *Xanthorrhoea resinosa,* which grow in conjunction with a variety of sedges and small sclerophyllous shrubs.

SCG Community 15: Sedge Swampland (Fig. 6f; 7 sites).
An open-sedgeland community usually occurring on waterlogged soils near the wetter parts of Coastal Heathland. In most cases the vegetation is dominated by one or two species of sedge, often to the exclusion of all other species (e.g. *Lepidosperma longitudinale).*

SCG Community 16: *Melaleuca ericifolia* Scrub (Fig. 6g; 7 sub-communities; 32 sites).
A closed-scrub community dominated by *Melaleuca ericifolia* but with a varied understorey. Thickets of *M. ericifolia* are found on wet heavy soils in lowland areas in four distinctly different environments.

(i) Sand-clay soils in association with Coastal Heathland.

(ii) Clay-loam soils on highly disturbed, often pastoral sites associated with Riparian Scrub or Grassy Woodland.

(iii) Poorly-drained sands in disturbed coastal regions associated with Coastal Banksia Woodland.

(iv) Poorly-drained coastal mudflats inland from and associated with Salt Marsh.

SCG Community 17: Riparian Scrub (Fig. 6h; 2 sub-communities; 12 sites).
A closed-scrub to open-woodland of lowland, shallow and slow-running watercourses and alluvial soils. The sites on which this community is found are generally very disturbed and support large populations of introduced, opportunistic species. Chief amongst the native species are *E. ovata* (an occasional stunted tree), *Melaleuca squarrosa* and *Leptospermum* spp., which dominate the shrub layer, and a range of sedges, grasses, herbs and ferns, each of which may dominate the ground layer in localised patches.

SCG Community 18: Unclassified (Fig. 7a; 3 sites).
A disturbed, species-poor vegetation dominated by *M. squarrosa* and possibly a depauperate version of Coastal Heathland.

SCG Community 19: Mangrove (Fig. 7b; 2 sites).
A closed-heath to closed-scrub community consisting entirely of one species, *Avicennia marina,* and forming a broad band between the Salt Marsh and the sea along the coast of Corner Inlet and the offshore islands.

SCG Community 20: Salt Marsh (Fig. 7c; 21 sites).
An open-heath to closed-herbfield community of salt-tolerant, often succulent species growing on the intertidal mudflats of Corner Inlet and the offshore islands. The community is markedly zoned from seaward to landward. The outermost band is usually made up entirely of *Sarcocornia quinqueflora*. Landward from this is a heathland which is dominated by *Sclerostegia arbuscula* growing over a range of herbs. Further inland is a closed-herbfield with a mixture of low herbs and semi-shrubs.

SCG Community 21: Coastal *Banksia* Woodland (Fig. 7d; 2 sub-communities; 9 sites).
A low open-forest to woodland found on well-drained calcareous sands of coastal regions. The large shrub *Banksia integrifolia* dominates an understorey of smaller sclerophyllous shrubs, herbs and sedges.

Sub-community Summary Sheets

The following three sets of information have been amalgamated to produce a summary sheet for each of the 46 sub-communities. These summary sheets constitute the primary means of describing vegetation in this paper.

Sub-community Distribution Maps: the distribution of each sub-community throughout the study area is shown by means of a schematic map of the study area on which is marked the location of its constituent quadrats.

Character Species Tables: These tables summarise information from the two-way tables and present it in a different format. The tables contain the character species of each sub-community, listed in order of their frequency of occurrence, and the frequency and mean cover/abundance of each species. In contrast to the two-way tables, in which the species are arranged to demonstrate the interrelationships between sub-communities, the character species tables have the species arranged to show their relative importance within an individual sub-community.

Sub-community Descriptions and Annotations: A simple description has been made for each sub-community which includes briefly summarised information on its distribution, environment, altitude, structure, floristic richness and weed composition.

Table 1. Two-way table of Communities 1-5.

SUB-COMMUNITY	1.1	2.1	3.1	4.1	5.1	5.2
QUADRATS / SPECIES	4444444444444000000000000000000000					
	0000000000000999999999999999999999					
	2222222222222000000000000000000000					
	0000000001111441002425333534315515531					
	4567802312301234938132349346059066527 4					
Astelia alpina	11+11					
Empodisma minus	12121					
Epacris paludosa	1212+ +			1		
Olearia algida	1+1+1 +1					
Richea continentis	+2411			+ 1		
Sphagnum spp.	42+22					
Baeckea utilis	++++					
Blechnum penna-marina	++++		1	1		
Gentianella diemensis	1+++					
Craspedia sp 'D'	1+++					
Euphrasia gibbsiae	11 +1					
Thelymitra venosa	+1 +1					
Carpha nivicola	11 1					
Lycopodium fastigiatum	++ + 1	+ 1				
Isolepis aucklandica	1++					
Callistemon sieberi	+1 1					
Ranunculus collinus	1++	21		+		
Poa hiemata	++1	111				
*Cerastium fontanum		++1+	+			
Senecio gunnii	+	+++1	+	+++		
Carex breviculmis		+ 11				
Orites lancifolia	+	+ +1	2			
*Poa pratensis		+21				
*Rumex acetosella		+ ++		+		
Hydrocotyle algida	+1+	1+123	11			
Asperula gunnii	++ +	+	+ 1+	1		
Pultenaea muelleri	+	2 2	11312432			4
Eucalyptus pauciflora			4534434			+
Gonocarpus montanus			+11 2+	+		
Poa labillardieri			4234			
Uncinia compacta			2 2+			
Gahnia sieberiana				+++ +		2
Oxalis magellanica	+			11+1		
Carex appressa	+1 1	1		+422	+	
Epilobium gunnianum	1++			12 +	++	
Leptospermum grandifolium	++ +		1	222+1	2	+
Leucopogon gelidus			+1 1	++ 1+		
Wittsteinia vacciniacea	++		11 1	1 12+		
Coprosma nitida		+	2 2 1	++1 1		
Tasmannia xerophila	+	1	+2 32+	1 1		
Trochocarpa clarkei		+	+1 21+	1 +		
Leucopogon maccraei		+	2 + 2	31215		
Nothofagus cunninghamii			2 23	2+222		

Olearia phlogopappa		1 1+	2122221	11+122	11 1	+ +	
Viola hederacea		1 +1	32123++	2+ +	+1 ++1	+1 +	+
Oreomyrrhis eriopoda		1+11	+ 11+	121	+ +++		
*Hypochoeris radicata		1+11		2+2+	++ 1 +	+ 1++	
Polystichum proliferum		+1	+1 +	11+111	22112	11+	
Senecio linearifolius		++	++	11 ++	+1+1+1	1+	
Coprosma hirtella			21	++ 11	1 1 +	1	+
Hydrocotyle hirta			+	+21 ++	+1+ 1	+	
Ranunculus plebeius				111+ +	+1 ++1		
Cotula filicula		+	12	11 +	++		
Acacia dealbata				+ +11	121 +2	1111+	+
Luzula campestris			+	111 +	++ 1++	++++	
Stellaria pungens			1	1	11 +11	1 +	
Gnaphalium japonicum		+		1++	1 ++	+++	
Lagenifera stipitata		1	+	11 +	+1+ 11	+1+	
Senecio quadridentatus				1 1	++ +1+	++ +	
Geranium potentilloides			1 1	+111++	+111+	++1	
Acaena anserinifolia			+ +	1111+1	++1112	11+ 1+	
Polyscias sambucifolius		1		+21+211	+ 1+1	+1++	
Stylidium graminifolium	++	+ 1	+4 311	2+ + 1	1+ 1 1	+2+112	112
Poa australis sp. agg.			2131 411	1232112	2212211	2+	
Dianella tasmanica			2 112	1+1111	+221 +	1+2	
Cassinia aculeata			111 +	2222+1	3+2+	1	
Eucalyptus radiata				3211121	211 1	12	
Pteridium esculentum			+	1+11+1	111+++	1+1	
Acacia mucronata				31+3 2	221222	122+	
Daviesia ulicifolia			1	2+ 1 1	1122133	223	
Eucalyptus cypellocarpa				22 212	121 11	111	
Eucalyptus dives				1 1	2112223	222	
Epacris impressa				2 +	2242124	213	
Tetrarrhena juncea				2 2 2	322+12	1	
Lomandra longifolia			1	1 +5	11+11	12	
Pultenaea juniperina				2+ 2 1	+12 2	1	
Rubus parvifolius				12+ +	+1+		
Clematis aristata				11++	+++ +		
Oxalis corniculata				+++	+++		
Acacia melanoxylon				11 2	+11		
Chiloglottis gunnii	+		++	+++ +	+ +1		
Coprosma quadrifida				+1 +1	11+ ++		
Asperula scoparia				+1 1	++ +		
Pomaderris aspera				21	1+1		
*Rubus fruticosus sp. agg.			++	++	+++ +		
Deyeuxia rodwayi			1	1 ++1	1 1		
Eucalyptus viminalis				+3 1	+1		
Dianella revoluta					1 +	++11+2	
Tetratheca ciliata			+	+	1231122	111	
Monotoca scoparia				+	+++	22212	
Persoonia confertiflora				+ +1	+ ++111	+	
Cassytha melantha					+ + +++	2	
Dillwynia retorta					13 123	2	

Table 2. Two-way table of Communities 6 and 7.

SUB-COMMUNITY	6.1	6.2	7.1
QUADRATS / SPECIES	222222222222222002110100002122	222222222222201100100000111102111111102222100100110122000110	
	777777777778888997009099995077	877578888889009909999900009700000097577099099009052999009	
	000000000000000000000000000000	000000000000000000000000000000000000000000000000000000000000	
	112000000111020261452405502011	121211142006154404200534226544500441725542101543141130033 6	
	165645231278104588023649737435	800547626577012811797823861175032492800220885119782582178 0	
Cyathea cunninghamii	+1+++		
Cyathea marcescens	+ ++++		
Blechnum chambersii	++	+++ 21	
Polyphlebium venosum	+11	111 11+++	
Fieldia australis	2 21+2+1+	2211 1 21+	
Hymenophyllum australe	+1	111 1 +	
Asplenium bulbiferum	1+1++++++	+++11 111+1+1 +	
Blechnum fluviatile	++++	+ 1 + 1+2 1 ++ + 1	
Atherosperma moschatum	+++12+2	+ 2 2 +2+	
Nothofagus cunninghamii	3344223+++	3111 2 4 3221 ++ 1 +	
Rumohra adiantiformis	1+2+++ +	1+2 ++11+1 + +	
Microsorium diversifolium	++21+1+	+++1111 +11+1+++ + 1 ++ + +++ ++ +	
Grammitis billardieri	++ ++1+++	+1+ + 1++++ 1+ +++ + + +	
Cassinia trinerva	+++ 1 +	2 + + 3+ +++11 2	
Blechnum wattsii	212 1 2	+++2112 3+1 2 232 2+2 1+ +1+ 1 1+121+121+211+1+	
Hedycarya angustifolia	2+2 ++	+++1 3121231 1 1 3 ++ +2+3+112 11 1+12 1 2 + 11+1+++ 1 +	
Histiopteris incisa	+ ++	1 +11+1 1+++1+ + + +11 +11+++2 +11 1111+++ ++ + + 1 ++ +1 + +	
Australina muelleri	++1+++ +	+2121 11+1222112 + 1 + 1 + 1 11 + 1+ 13++1 ++ +1221231++1++	
Dicksonia antarctica	455343343	45421343312212 32+2++1 +1 11 1++3+22 2133+ 1 +1 ++ +++ ++121+22+ +2 ++	
Polystichum proliferum	3 2 +2+++	1+2 1 +2222+12+4+++ 4 +5 1 212+ 1233 1321 12 121221++ 1+53 1213131+11++1 ++11	
Carex appressa	+++ +	++ 1 1+ 1 111 + + + 1+ 1 ++ + 1 1 + + 11 11 ++ 1	
Clematis aristata	+ + + +	++11+111+ +11+111++++ +++++11111++1111 +112 111++111111++ ++111111+112 ++1++1+1	
Olearia lirata	++	1+ +11 1 1 1 +2 132 3122122 11+ 1 + 22 33211 1 + 441 + 21 2 ++22	
Eucalyptus regnans	+ +	2+22123 + 112 133 433 33542 33312 21414344 3 3 3123234+1 53 221 4+ 5232 2	
Acacia dealbata	+ +	++11 21 1 +1123 2+++ 2 2 +2111 1121211132 +11112 1211 3 ++ 124221 21 11111	
Olearia argophylla	+ +	++1111 312 2 +++ +1 +2 1212 12 1132 1 +1111 2 2+211 2 2413 312 1	
Acacia melanoxylon	31	54 22 1 2+ 2 25 3+ 2+13+111 31 11 1 111 1231 +1 +1 +3+3 2+ 1 3 15+ 11122	
Tetrarrhena juncea	+++	+1 3 +22 +2 224 14+ 4222212+ 22 2 32421+31+221+13 1 2+113 11 +++12113	
Coprosma quadrifida	+ +	++ 11 11 11 1 12 ++ 2++2+11211131+ 1 1+1+12+1+1111111+2311212211+111+++1 111	
Cyathea australis	2++	31212221+31 2 1 +4132 123+342 13 +1+11++211221221+122121+1 ++12 2 1 1+ + +	
Sambucus gaudichaudiana	+	+ + + 1 + 1 1 1111 111 ++++1++1 +++++ 11+++1+ + +	
Urtica incisa		+ + 211 + + 1+ + + 1 + + + 12 1+1+1+++ 2	
Stellaria flaccida		2 1 1 + ++ +1 21 1 ++2 121 +3+++124112 11 +31 + 2	

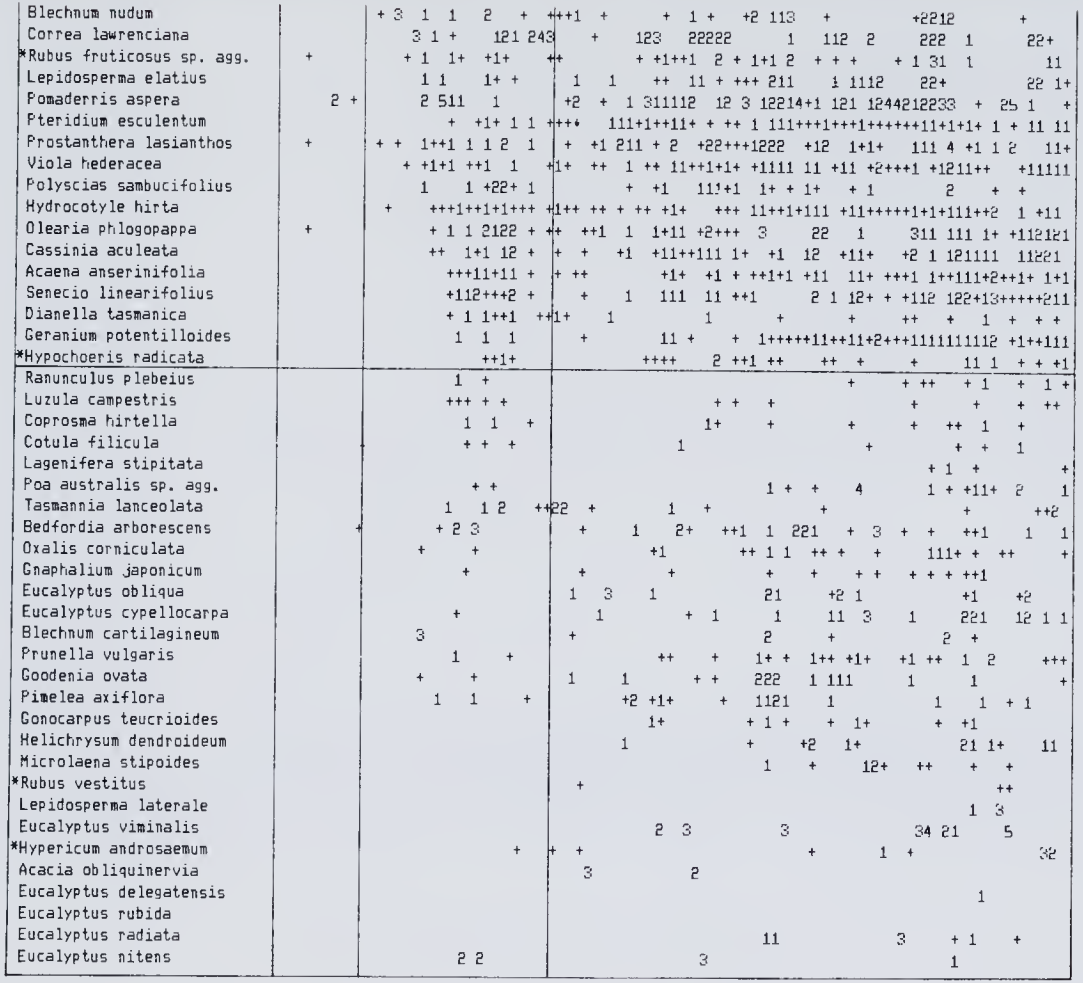
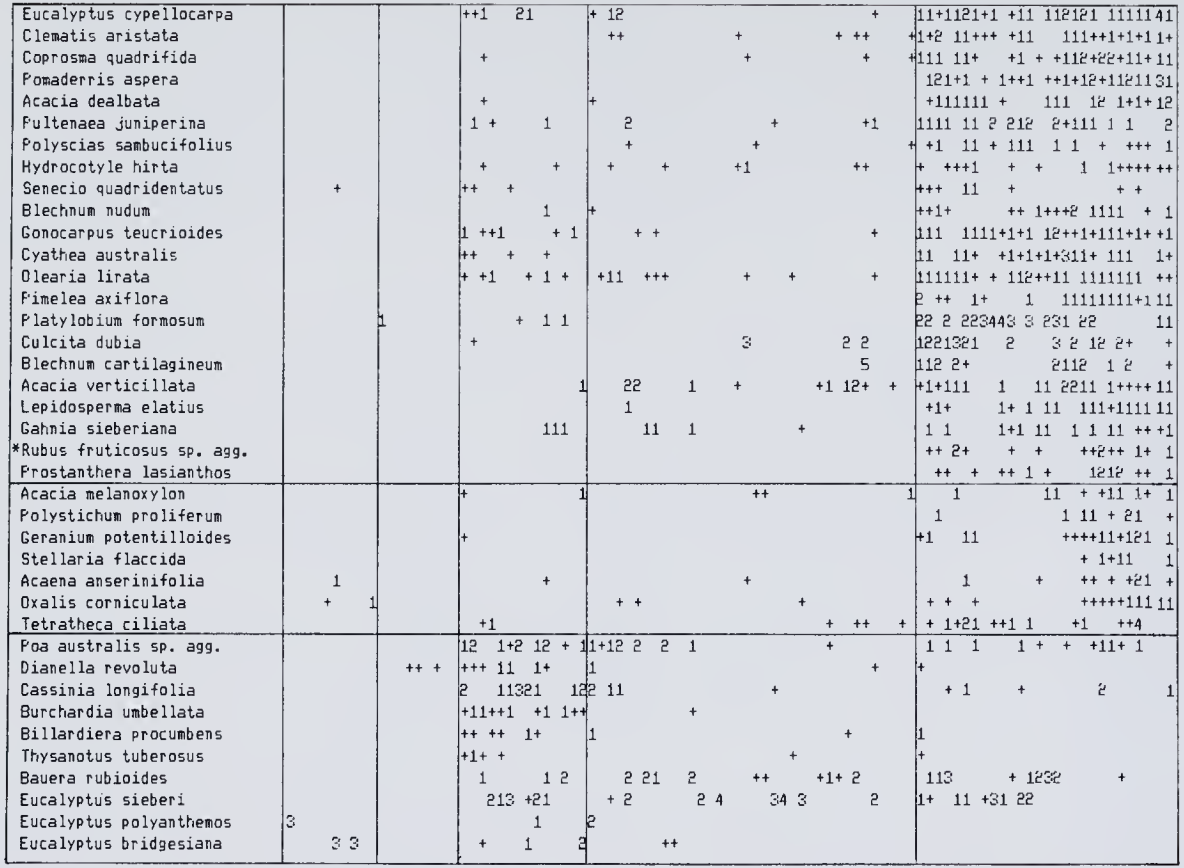

Blechnum nudum
Correa lawrenciana
*Rubus fruticosus sp. agg.
Lepidosperma elatius
Pomaderris aspera
Pteridium esculentum
Prostanthera lasianthos
Viola hederacea
Polyscias sambucifolius
Hydrocotyle hirta
Olearia phlogopappa
Cassinia aculeata
Acaena anserinifolia
Senecio linearifolius
Dianella tasmanica
Geranium potentilloides
*Hypochoeris radicata
Ranunculus plebeius
Luzula campestris
Coprosma hirtella
Cotula filicula
Lagenifera stipitata
Poa australis sp. agg.
Tasmannia lanceolata
Bedfordia arborescens
Oxalis corniculata
Gnaphalium japonicum
Eucalyptus obliqua
Eucalyptus cypellocarpa
Blechnum cartilagineum
Prunella vulgaris
Goodenia ovata
Pimelea axiflora
Gonocarpus teucrioides
Helichrysum dendroideum
Microlaena stipoides
*Rubus vestitus
Lepidosperma laterale
Eucalyptus viminalis
*Hypericum androsaemum
Acacia obliquinervia
Eucalyptus delegatensis
Eucalyptus rubida
Eucalyptus radiata
Eucalyptus nitens

Table 3. Two-way table of Communities 8 and 9.1-9.3

SUB-COMMUNITY	8.1	8.2	9.1	9.2	9.3
QUADRATS / SPECIES	222222222222222222211111122201122222222222212222222222222202222122221111021100000010000102111101 333333333333333333300000088890088888888882022227722277239259220222200009800999999099999098000099 000000000000000000000000000000100000000002000200220200020202002202000000000000000000000000000000 010338557607677147722212353241311134320127833110133310032436252012001221222016164823613314113206 61 607570346987512120472099070458446248338516876543245004274559241644993564959140570656121763851362 33
Lepidosperma concavum	2112 13 2 + 1		+	
Kunzea ericoides	2 22125 1 +	+ 2 + 2	4 +	22 + 23
Eucalyptus globoidea	3 2 3245+	11 2 2	2 4+ 3	1 1
Banksia marginata	1 +2	1+ 1 1+1+	2 +++2	
Gramineae spp.	++ + 3121	2+ 11 1+	2	
Pimelea humilis	+ 1+1 1++1+	1+++1 + 1	++ ++ + + 1	
Hibbertia acicularis	+ +	1+++ +1		
Eucalyptus consideniana		3443334423	1 2211+231132	
Xanthorrhoea minor	+	31 1+	2 ++11 2112 1	1 1+ 1+ ++ + + 1 2 +
Gahnia radula	+ 332	113 3212	13221332211 2315+ 1 3213++ +2252134 3222+++133+	111 +
Lomandra filiformis	1 1 +1+	++11111+1	+1 111111++1 1	112 +1+1 2++++1++ +++++ 1+ + + 1 ++ +
Pteridium esculentum	2444 23 522	4234 31	1112 12++ +1	+3+22311 2153 54 21+4322+ ++22+2 2111322121213131+1112+ 11+31 12
Lomandra longifolia	2 2 2 2	1 + +	++ 1+1 + + ++	+1++1++ ++1++ ++ + 2 ++ + +++ + ++ + + ++11+
Drosera peltata		+11++1+ + 1 +	+ +1+ + +2 + +++ +	+11+
Lindsaea linearis		1+ + + 11+11	1111 +1 + + +	+ +
Xanthosia dissecta		++++ +++	+ 1 + ++ ++	+1 +
Epacris impressa	+ +	1111111+131111	1 ++1++++++++++1 +++ ++11++++1+++	111+ +
Pultenaea gunnii	+	111113 111+221	++ +++ ++ +1+ + 2+++	111
Microlaena stipoides		+1 1+ 1	+++ 1 ++ + ++ ++2+ ++	+ 1 2
Amperea xiphoclada		+111 11 2+	1 11 +1++++ 2 21+ 1+++	1111 ++ 11 + + 1
Leptospermum juniperinum	1	4 1 1	212111 2221	1+ +143 +2++1 ++++++++ 1 + + +3+ 1131 1 1 11 3 1 1
Goodenia ovata			11+112 2+ 1	+ + 23+ + + +2+ +	22+1211+2+11 + 112+1211+1 1
Billardiera scandens	1		+ ++1 + 1 +	+1+ ++ + + ++++++1+++1 1++++	1 ++ ++ + 1 1 + + +
Gonocarpus tetragynus	+ 1		+1+11111+111 1	1+1+2 1 1++1+++ ++++++++1+1++++1++++	11+ 1 1
Acacia mucronata			221222+++111222	2 ++ +224+ 232+ 21+1+ 3++++	1111222 4 2+31 1+ 11 2+1 1
Eucalyptus radiata	4		+11 + 2	2+ 122 415 2+355 + 31423314155	1222 121 12+ 11 + 1 2211 1
*Hypochoeris radicata	1 +		+ ++ ++++ ++ +	+++1 1 +1 ++ + + + + +++ ++ + ++	+++ ++ + ++ ++1++ + 1
Viola hederacea	+		1+ + 1 1 1 + 1	+ ++1+1 + 1 + +++ + ++++++1+ ++	111 1111+++11+++111++11++1 11
Tetrarrhena juncea	+ +		3222+3 1221322	14223 23 + 2231+3+ +2323+223282	2232223334322422323321 32+4 22
Eucalyptus obliqua			2121++31 21	12 21312 32 +3313 +1+32234532332	3+22+3222+2222122212112211 12
Cassinia aculeata			++ 1 ++ 1 + ++	+ ++ + + ++ + ++++++++	1++1121+ 122+ +11++ +1+3++2
Lagenifera stipitata	+		+ + 1+ 1	1 1 1 +2 1 + ++ + +	+ ++ + + 1 +



Eucalyptus cypellocarpa
Clematis aristata
Coprosma quadrifida
Pomaderris aspera
Acacia dealbata
Pultenaea juniperina
Polyscias sambucifolius
Hydrocotyle hirta
Senecio quadridentatus
Blechnum nudum
Gonocarpus teucrioides
Cyathea australis
Olearia lirata
Pimelea axiflora
Platylobium formosum
Culcita dubia
Blechnum cartilagineum
Acacia verticillata
Lepidosperma elatius
Gahnia sieberiana
*Rubus fruticosus sp. agg.
Prostanthera lasianthos
Acacia melanoxylon
Polystichum proliferum
Geranium potentilloides
Stellaria flaccida
Acaena anserinifolia
Oxalis corniculata
Tetratheca ciliata
Poa australis sp. agg.
Dianella revoluta
Cassinia longifolia
Burchardia umbellata
Billardiera procumbens
Thysanotus tuberosus
Bauera rubioides
Eucalyptus sieberi
Eucalyptus polyanthemos
Eucalyptus bridgesiana

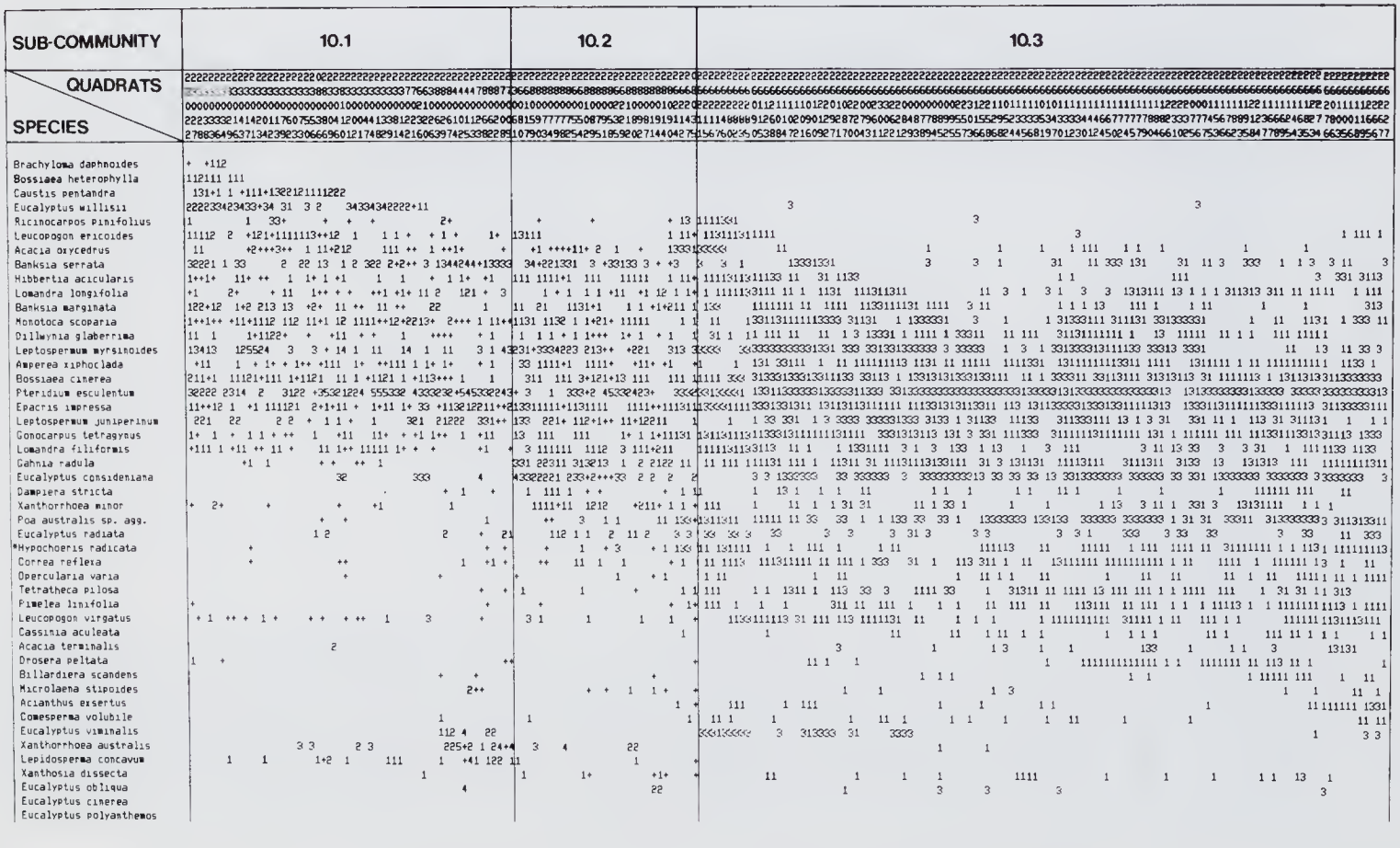
Table 4. Two-way table of Sub-communities 9.4-9.6

SUB-COMMUNITY	9.4	9.5	9.6
QUADRATS	2222222222212222222222222222	22222222222222222222222222222222222222222222222222	2222222222222
	5222222252707522555225557 25	772778777587258788278578225582758877277877222257 5	5225525255555
	0000022202000020002200002 0	000000000000200000200000220002000000200000220000 0	0020000000000
	1110122152424122442053540 58	31424348437344433152433112320315424235427112214 4	1011102202441 0
SPECIES	7893356438814873189609507 1	06768432266923135124850269807816659109336781023 74	07795841937248
Tetratheca ciliata	+++++		
Acacia mucronata	+ 42++++		
Pultenaea gunnii	+++++ ++ 1		
Epacris impressa	+ ++++++ 2 ++++++		
Eucalyptus sieberi	5 4 2 5 24		
Eucalyptus radiata	42 323 +3 + ++ +2++2553124	+	
Lomandra longifolia	++++ +++2++ + + ++	1+++++ +	+
Pimelea humilis	+ ++ + 1 +	+ + ++	
Gahnia radula	++ ++22+313 +2+ + +	+4+2+ 2+1+++++ + 3	
Leptospermum juniperinum	1 + 1 ++ ++	+ + + +	
Lomandra filiformis	+ ++ ++++++ 1+ ++++++ +	2 +1++ + ++2++	
Deyeuxia quadriseta	++++++++++ + + ++ +++	+ ++ + ++ + ++++	
Senecio hispidulus	++ +++++ + +++ ++++ ++	+ + + + ++++ + ++	+
Glycine clandestina	++ + + ++ + +	+ ++ ++ 1 +1 1 ++1 1 +	+ + +
Danthonia racemosa	++ + ++++ 2+ + +	+ +1 1 1 2 +1 ++2	+
Billardiera scandens	++++++++++ ++ +++ +++	++ ++ + 1 +++++ +++	+
Poranthera microphylla	+ ++ + ++ + +	+ +++ +++++ +++ + +11+	
Gonocarpus tetragynus	+++ ++++++11++++++ ++ 1++	+ ++ 1++++ +++ 11 + 1 + 1+ + +++ +	+ ++
Wahlenbergia quadrifida	+++ + + + + + + +++	+ ++ 1 ++1 1 +1 +1+ +++ + +++++ +	++
Poa australis sp. agg.	++ + +++ +2+ + +1 3+	2 2233 4 32+ 1 21 45 32 + 4+1 21 1 1322+	
Veronica calycina	++ + ++ + +++ ++ +	+ ++ +1 ++++ + ++ +++ 11 +++ 1 ++ ++	
*Hypochoeris radicata	++++++++++ ++ +++ ++++ +	2+ + ++++ +++ + + ++++ ++ +++ ++++ + +++++	+ + +
Coprosma quadrifida	+ + + ++ + + +	2 + +1 ++1+ + +++ 1++ +2+2 3+++322++ +2 +	++++++1+++2+ +
Pteridium esculentum	212+223 223222+1+++33132221	3 312 3+ 331 +4 1 331 12++2111++213++3++2 +	+ +++1+++ +++
Viola hederacea	+++ ++++++++1+++ +++++ ++++	2+++++ ++++++++ ++++1+21++ 1+++11+ +++ + + + +	++ ++++++++++
Tetrarrhena juncea	+14+ ++ 2+3 +11121+2 3+1	+ + 2 +1 4+ 11 2 +11 3+2 +41 2 + + + +	+++++++ 112+
Geranium potentilloides	+ + + + + + ++	1 + + 1++ +11+1 + 1++ 2+++11+++++++ +	+++ ++ + ++
Lagenifera stipitata	+++ ++ +++ +++ + +++++++	2 + + 1+1+++ 1 + +++ + 1 + + + +++ +	+ ++ + ++
Clematis aristata	++ +++ ++ ++ 1+++ ++1	+ +++1 ++2+++++ ++ 1++1++++12++11+++++1++++2++ +	++++ +++++++++
Acaena anserinifolia	+++ ++ +++ + +++ +++	+ + + + +1++ ++ ++ + ++++ 1+1+++ ++ +	+ + + + ++ +
*Rubus vestitus	++ + +++ ++ +	+ + + + + ++++ + + ++ 1	++++ ++++ 12+
Eucalyptus cypellocarpa	33 22 ++2 4 123	242 5 55 1 +15 223 2 213+ 5 33	2 +4 24 3
Microlaena stipoides	++++++++ + ++++++++++	1++++ +11+11++13+ ++111+++++1 ++1+ + + +++2+++	+++ + +++ +12
Cassinia aculeata	1 +++ +++++1 +++++ + ++	++ + + ++ + + + +1++ 1+2 1+ + +1 2+	+ +++ +
Hypericum gramineum	+++++ + +++++ + + ++	+ ++ + + + ++++++++ +1 + +	+ + +
Eucalyptus obliqua	45 +43535 2222355532 2343	3 5 45 32 1 5 4 5 3 2 4 1+2	+ 12 5
*Centaurium tenuiflorum	++ + ++ ++ +	+ ++ + 1 ++ + + +++++ + ++	++ + +
Oxalis corniculata	+ ++ ++ ++ +	+ + + +++ ++ ++++1 +1 + + 11 + ++ ++ +++	+ + + ++ ++
Senecio lautus	++ + ++ ++	+ + + + 2 + +1 ++ + + + + + + ++ +	+ ++
Dichondra repens	+ + + + + +	++ + ++ +11 + 1+ ++ + 1 + ++++	+ + + +++
Helichrysum dendroideum	+2 1+ +3+ 2 +	3+2+ 1 +++ +1 + 2 212 121 ++2 ++31 2+ +	+ + 3 5+1 +5+
Goodenia ovata	+ + +++++++++ ++	+ + + ++++ +13 1+ +2 1+4 1 3 +11 3 + 3	+ + 4 +
Hydrocotyle hirta	+ + ++	+ + +++ + + + 1 + 11 ++ ++2+ +	+++ ++ + ++++
Acacia melanoxylon	+ + +	+ + +2 + + + +2 2 1+ +21+ 2 5 2+	3+442+3+3+5
Echinopogon ovatus		1 +1+1+ + + + ++++ + + +1+ + +	+++++++
Eucalyptus viminalis	4	+ 5 5 55 2 3 24	+443 2
Poa labillardieri		3 + + +4 +++3 + + 3 53++ 1	+ + ++++1 4
Pomaderris aspera		+ + + + + ++ 1+++ 23+ + 2 5	+ 1 5+ 51
Stellaria flaccida	+	1 + + + 2 1 ++ +++	+++++++ ++ +
Rubus parvifolius	+ +	+ + + + +++ + +++	+ + +1++
Acacia dealbata	+ + 4	2 2 4+ + 2	22 2 3
Polystichum proliferum		+ + + + +2+	+ + + +++ ++
Geranium solanderi	++	++ + + 1 + +++	+ +
Olearia lirata	+++ +	+ +2 + + +1 ++ +1 1 + 21 + +11+	
Melaleuca ericifolia	3	+ 1 1 + + 3 3	
Eucalyptus muelleriana	2 3	2 3223+ 2 222 33 31 2 + 33+ 32 +	
Eucalyptus globulus		+233 3 31 + 32 3 134 2+	

Table 5. Two-way table of Sub-communities 9.7-9.9

SUB-COMMUNITY	9.7	9.8	9.9
QUADRATS / SPECIES	2222222222222222222222222222222222222222222222222222222222222222 6666666666666668666666666666666666666666666666666666666666666666 1211111112110111122212211212232102212202200000000000000010 4275844772925905957706720509907175618716866666656566982429 3510179388676942719724889048905034017289645302107898918729 4		
Drosera peltata	1111111111 1		
Gnaphalium japonicum	1 1 111 11111	1	1 1
Gramineae spp.	31 31 111111 11311 1	1	1 1 1 1
Banksia serrata	33 13 13 1 1		
Amperea xiphoclada	1 1 1111 1+ 1 3111 1		3
Bossiaea cinerea	11111 1 11 1313313 1	1	11 1
*Holcus lanatus	1 1 1 1 11 11 13 1	11	11 11 13
Leucopogon virgatus	1 1 1 1 113 1 111111		1
Opercularia varia	13 1 1 1 1 + 11 1 1 1111111	1	1
Eucalyptus consideniana	3 33 33 33 3 3 31 313 3333 3		3
Correa reflexa	1 1 1 1 + 1 11 31 13 1		
Gnaphalium spp.	11 1 1 1 1 1 1 1 1111		1
Lagenifera stipitata	3111 111 1 1 1 1 1 1 1 1111 1111111		1 1 1
Acianthus exsertus	11 11 3 3 113 1 31 1111 1 11		
Eucalyptus viminalis	3 3 3 33 1 33333		
Helichrysum scorpioides	1 1 11 1 1 11 1113 1 1 3		
Lomandra longifolia	3 1 13 12 111 11 1 11111113 111 31		1
Pimelea linifolia	1 1 1 111 11 1 1 11311111 11 111	11111	1
Acrotriche serrulata	1 1 1 1 + 11 11 1 1111 111 1 3111 111	311 1	1
Hypericum gramineum	1 111 1 11 11111 11111 1	1 1 1	
Pterostylis spp.	1111 1 1 1 1 11 11111 1 1111111	1 1 3 111	
Cassinia aculeata	1111 3 1 1 11 31131 31 11 3	1 111 1 1	
Senecio gunnii	11 11 11 1 11 1 1 113 111 111 11	1111 111 1	
Poa australis sp. agg.	3113 133313331133333 3333313333333333313333333	3133313311311	
Epacris impressa	33 11 11 1111 13333331111111313 111 1 1111	111 11 11 3	
*Hypochoeris radicata	11 11111111 11+113311111313311131 133111111111111133111 11		
Pteridium esculentum	333333333333333233331333 331333333333313333131 13333 3313 331		
Leptospermum juniperinum	111111 3 3 + 31311113 11 331 133	33311 3 133 1 1	
Gonocarpus tetragynus	1111 111 13 3133111133 13	133111131111111 1 1 331 11	
Eucalyptus radiata	33 3 3 23 3 13 3 33 33	3333 33 3333 3333133333 33333	
Gahnia radula	111 33 13 33 33111 1 3 13 31	13 33 13 3 3 3 3 3111	
Lomandra filiformis	1 11132 3 11111 1 33333313	1 3 111131 1	
Microlaena stipoides	1 + 11 1 1 311 111 111 1	1	
Poranthera microphylla	11111111 + 11 1 1 1 1	1 1	
Xanthorrhoea minor	1 1 11 1 13 1 1 1	13	
Billardiera scandens	11 111 1 1	1	
Pimelea humilis	1 1 1 1 1 1 13	1 1	
Cassinia longifolia	1 3 3111	11 1	
Eucalyptus obliqua	3 31 1 313	1 33	
Viola hederacea	1 11 1 1 1 1111 1	111 1 1	
Olearia lirata	1 3 2 1 1 1 1 1	1 3 11	
Eucalyptus bridgesiana	3 3 3 1 3 33 3	1 3	
Kunzea ericoides	1 31 3 1 3 3 3	333 133 3	
Xanthosia dissecta	111 1 1 1 11 11 1	1 1 3	
Dichondra repens	1 1 1 1 + 1 111 1	1 1 111 1	
*Conyza bonariensis	11 1 11 1 1	1 1 1111 1	
Banksia marginata	3 1 3 11 1 3		
Eucalyptus melliodora		3 3 33	
Eucalyptus ovata		1 3	

Table 6. Two-way table of Community 10.



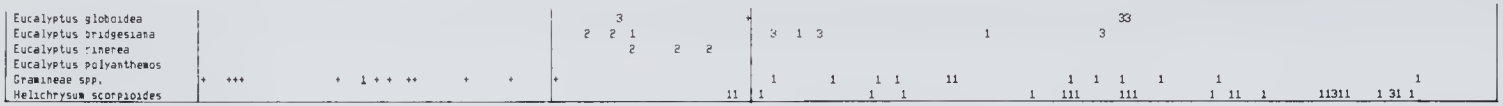


Table 7. Two-way table of Community 12.

SUB-COMMUNITY	12.1	12.2	12.3	12.4
QUADRATS / SPECIES	222222222222222222222	222222222222222222222222222	222222222222222222222222222222	222222222222222222222222222
	888888878888788888866	666666666666666666666666666	666666666656666666666666666666	666666666666666666666666666
	011000000001001010110	100022222212202111222202222	020231011111233221211112222222	300200011000002000222221102
	800678948990380916141	522200010444430899640787398	869390106999690099148658300039	008050005522221300034558551
	553072353786219611382	401268905364297834354342438	960855240012176764309297831092	241297388534560715639231611
Dichelachne micrantha	++1 ++++			
Eucalyptus muelleriana	+12122332123+			
Lagenifera gracilis	1+1 ++ + + + 1 +			
Gnaphalium japonicum	+ + ++ 1+1 1	11111	+	1 11 1
Tricoryne elatior	+ 1+ +++ + + +++	1111	1 + 1 1	
Astroloma humifusum	+1 1+ ++1 + +111	11 1 111		11 1
Xanthorrhoea minor	+ + 12 1+1 1 +1+	111111		
Pimelea humilis	1111+ 1++ 1 + +111	1 1 1 111	1	
Bossiaea prostrata	1+ ++++++ 1 1	1 1 1	1	1
Acrotriche serrulata	+ ++ + + +1	11111 1111 1113	1	11 1
Kunzea ericoides	1 1 343 +	111 3 3 1331	1 3	1 3 333
Lomandra longifolia	1 32222 1++ 1+31	31 1 1 1 11 1311	3 111	
Microlaena stipoides	1 1+++ 221 +3+1 1+11	1 111 1 11 1 11	331 1 11 33 131333	1 11 1
Lomandra filiformis	2122211+++ 1+ 1 12	111111 1 11 133	11 1 1+11 11 111111	
Poranthera microphylla	++ 1+1+ + + ++ +++1	111111113 1 1111	11111 1111	
Leptospermum juniperinum	1++ 1+	13 1111 11 1311 111	1 1 3 + 1	333 1
Gahnia radula	331+12 1 14 3+11	3 11 1 3311 31	31131 3 1 1 1	33 33 13 3 3 333 11
Viola hederacea	+ + + +1 ++ 1 ++	11 1 1 11 1	133 1111	11 111 1 11 3 1

Gonocarpus tetragynus	++ + + ++ 1	1 111 1 1111 1 3311 1 31	1 111 1 1 11	3 1 1 11 1111
Hypericum gramineum	11++++1 ++ 1 11+	1 111111 1111111 1 1	1 +1 1111	11 1 1 1 1
*Centaurium tenuiflorum	+ ++11 1 + + ++++	1 111 1 1 11 1	+ 11 1 1	1 111 11 11
Oxalis corniculata	111 11+ 1++++++1++ 1	1 11 11 111 1	1111111111+1111111 11 11111111113	1 1 1 111 11 1
Poa australis sp. agg.	1 +22+ 2+ 1 21113	13113333333 333331 3333111	3133133 3 13313 31331111 1 33	31 3 3111 13331 113311
*Hypochoeris radicata	++ 1+ + ++ ++ 11	131111111113133113311111 1	1111311313+333133313111333133131131	11 1111111 1131 1133331311111111
Pteridium esculentum	2 33331321 2 + + 14	333 333333333333 333 313	3331331113 3 3 33 3331333 33 3 3 1	3 1333333 3 3333333 31 1
Eucalyptus radiata	111 +1 23	3 3333331313333333 3333	33311 333+3 3333 3 33 33333 3333333	3 33 333 3 3333333 3331
Dichondra repens	+11 11++1+11 1 11+	111111 1 113 1 11 1	3 31 131113 13 3111131113 1	1 111 3 11 13 11 1 3 131 1 3
Eucalyptus bridgesiana	11 1+3 22 +312 3	333 1 3 3 3 33	3 3 + 13 31 13 3331 1	13 3 111 333 11 1 3
Gramineae spp.	2 1	1111 13 13 11 31	13 133 3 3 13333 11 11 31 13	3 3 33 11 331
*Senecio jacobaea	+ 1 +	1 111 1 11	1 1 1111 11	1 111 3 1 1 3 1
Hydrocotyle laxiflora	11 1	11111 331111111 3131 3 1 1	3313 31113 11 311113311311	1 1 33111 3 33 1 11 1 1
Eucalyptus viminalis	1 1 1 2	3 3 333 3331 3 3 33 1	1 333 2 33 3 333 3 313 3331 333	3 33 33 3 3133 133 3
*Conyza bonariensis		1 111 111 1 1 1 1	111 1 1 1	1 111 11 1 1 1 111 111 1 1
*Holcus lanatus		11 111 31133 33 331 1 1	1 3331 33+3331133 3133331131333333	3 13 1 1 11311 333313 131333
Pimelea linifolia		111 1111 1111111 1 111 1	1 11 1	1 1 111 1 11 1 1
Lagenifera stipitata	+ + 1+ + 1	1 1111111 1 11 11 11111	1 1 1 111 1 1 1111 1	1 1 1 11111
*Cirsium vulgare	+ +	1 1	111 1 11+11111 1 1111111111311	1 11 1 1 1 3 3 11
Senecio gunnii		1111 1 1 11 1 1 3 11	11 1 1 1 1 11	1 1 1 1 1
Veronica plebeia	+ 1	1 1 1 1 1	1111 1 1 11 111 1	1 1 11 111
*Rumex acetosella		1 1 11	1 11 3 3 1 11 111	11 3 1
Geranium solanderi	1	1 11 1 1	1 1 1111 1 11111 1 3 111	1 1 1 1
*Stellaria media			31 1 111 33 1111313311313	1 1 1
*Cynosurus echinatus		1 1 1 1	113 3 11+11311311311 331 11 31	31
Acacia mearnsii	12 +	1 1 1 1	3 333 3 1 33331	
*Briza maxima			1 31 2 13 133 1	1 1
*Plantago lanceolata		1	11 11 +1 111 1 1	
Acaena anserinifolia	+		111111111+1 1	11 1 1 1 1 1
*Rubus fruticosus sp. agg.		1	1111111	1 1
Senecio spp.	+ +	1 11 1 1	1 1	1 111 11111 1 11 1 1 1 1
Lomandra spp.	+ 1	331		3 333 1 11 33 11 1
Eucalyptus ovata	+1 1 + 2	3		3333 3 3 3 3 33 1
Melaleuca ericifolia	+ 1+33 22		3	3 33 3
Eucalyptus obliqua	2 1 3		33 3	3
Epacris impressa	+1 1	11 111 1 3	1 1	1
Drosera peltata	1	11 1 1 1 1 1	11 1	1
Cassinia aculeata	1	1 1 1 1 3	1 3 1 3	1 131 1
*Centaurium erythraea	+ +	1 11 111 1 1	1	1 1
Themeda australis	+1 1	1 1 11 1	4 1	1
Acacia paradoxa	31121 1	3		

Table 8. Two-way table of Communities 13, 14, 15, 17 and 18.

SUB-COMMUNITY	13.1	13.2	14.1	14.2	15.1	17.1	17.2	18.1
QUADRATS	22	222	222222	22222222222222	2222222	222222	222222	222
	55	444	333347	44444444447444	3333344	222222	225528	444
	00	000	000000	00000000000000	0000000	000222	220001	000
	33	333	563727	11120222116130	4666633	100000	235511	444
SPECIES	67	467	230877	78248532016619	8678402	152154	289765	789
Spirodela oligorrhiza	+2							
Lemna minor	+2					+		
Triglochin procera	+1	435						
Typha Spp.		33						
Eleocharis sphacelata		332						
Potamogeton Spp.		53						
Lepidosperma laterale			51 +		3	+4	2	
Empodisma minus			5111+3	31222222			++ 1	
Schoenus brevifolius			5 3 4	4332322433425				
Epacris impressa			1 1 +	1222222221 1 1				
Sprengelia incarnata			2 1	1 22+ + 3			+	32
Leptocarpus tenax			32 54	22 434333+1 1				3 1
Selaginella uliginosa			11141	2324134233+121	2 1		+	23
Xanthorrhoea minor			1 +	+ +2 22 ++ 2				
Lepidosperma filiforme			1	21222222				
Schoenus tenuissimus				2432242 11				
Lindsaea linearis			+	21221 1212 1				
Patersonia fragilis			+	222 1 31				
Casuarina paludosa			+	44+ + + 1+++				
Casuarina pusilla				32+ + 11 +				
Dampiera stricta				21121211 +				
Patersonia occidentalis				22 1 1112 4				
Dillwynia glaberrima				2221223223 + 1				
Xanthorrhoea resinosa				+3454555 1 5				
Leptospermum myrsinoides				2 221322 1				
Burchardia umbellata				+++++++1				
Hibbertia procumbens				12 222++ 1				
Epacris microphylla				1 22+++1 2				2
Eucalyptus viminalis				3 3+ +33+4 3				+
Lepidosperma longitudinale			5+	2 21+1 1	3555545			
Villarsia reniformis			4	1 + 1	122			1
Carex appressa						++++++	2	
Cyperus lucidus						++5++		
Hydrocotyle tripartita						++++		
Gratiola peruviana						+ +++++	+	
Helichrysum dendroideum						+++ + +	+	
Tetrarrhena juncea			+2		+	+ +++++	+ 1	
Melaleuca squarrosa			4435 5	4+33 22		3 +5 5	45534	555
Leptospermum juniperinum			4131 3	3454333333+122	1	+ 52+	+1 2	323
Blechnum minus						+1+	+2++1	
*Hypochoeris radicata			+	11 +	1	+ + +	+++++	
Gnaphalium involucratum						+ ++++	++ +	
Isolepis inundata		5				+ ++ +	+1+	
Poa tenera						+++2	31 1	
Eucalyptus ovata			3			232	41 1	
*Rubus vestitus						+ + +	+ ++	
Viola hederacea				2		+ + +	11+	
Lobelia alata			1+	1 +1	1	+ +	+++++	
Juncus planifolius						+ +	+1+	
Gonocarpus tetragynus			+ +	1 2 11 111		+	++++	
Schoenus maschalinus						+	+ ++	
Gleichenia microphylla						+	++	
*Sonchus oleraceus							+++	
Hypericum japonicum			+	+			+++ +	
Hydrocotyle sibthorpioides							+++ 1	
Baumea tetragona			11		+		2152	
Gleichenia dicarpa			+				+11+	
*Solanum nigrum						+	+++	
Leptospermum lanigerum							4333	
Eucalyptus muelleriana			+					
Eucalyptus globoidea			+					

Table 9. Two-way table of Communities 16, 19, 20 and 21.

SUB-COMMUNITY	19.1	20.1	21.1	21.2	16.1	16.2	16.3	16.4	16.5	16.6	16.7
QUADRATS	22	222222222222222222222	222	222222	22	22	22222222	222222	22	222222222	2222
	44	844448888888848887747	888	888888	44	66	55555555	874474	88	447444444	7777
	00	000000101000000000000	101	000000	00	00	00000000	000000	00	000000000	0000
	55	555551050076055667756	090	335553	34	41	0300003	674464	44	426432221	7777
SPECIES	67	151020107906233542048	098	782549	91	65	56431251	914593	09	285086109	5463
Avicennia marina	55	+									
*Plantago coronopus		+11+ 12 +									
Gahnia filum		3222112 1									
Samolus repens		21112222+2						+ 2	+1	+	
Sclerostegia arbuscula		5 334 35 41									
Juncus kraussii		+342 431 +1 1						+			
Distichlis distichophylla		512+ 3 3 11 3231							3		
Disphyma clavellatum		1 ++1 2 3 + +323						+321+			
Sarcocornia quinqueflora		43444422444544144 53									
Carpobrotus rossii			++								
Gonocarpus teucrioides			+1								
Hibbertia sericea			11								
Lepidosperma concavum			221								
Leucopogon parviflorus			111								
Astroloma humifusum			++								
Lomandra longifolia			2+	21						+	1+
Imperata cylindrica			2+	+1							
Banksia integrifolia			211	221223					+		
Dichondra repens			11+	122111				1	1		
*Aira caryophyllea			11	+ 12 +				++ 1	+		
Pteridium esculentum			55	33 1				3		1	
Isolepis nodosa		3 +2 1 3	221	11111				21			
Senecio lautus		1 2 1 21	111	11				+ 2121		+2	
Rhagodia candolleana			2	+ 112				+2312			
Galium propinquum				+1 1+							+
Clematis microphylla			++	1 + 1				2			
*Conyza bonariensis			+	+2 + 1		1	+	+			
Lepidosperma gladiatum			1	223223							
Lagenifera stipitata				+ +1+				+	+	+	
Monotoca elliptica				+ 1				++			
Poa australis sp. agg.		+		122+ 3		3		1			+ 3+
Helichrysum rosmarinifolium					22					1	
Lilaeopsis polyantha					11			3			
Isolepis marginata					11						
Hydrocotyle spp.					22					1+3	
Leptospermum lanigerum					22						
Carex fascicularis					11		+ +				
Leptocarpus tenax					+2					213 4223	
*Centaurium tenuiflorum		++	1	+	++		+	+ +	+	+ ++ 11	
Phragmites australis		+			11	13	2 5 4	+		2 1	
Alternanthera denticulata							+1 +				
Calystegia sepium							2+3 +				
Carex gaudichaudiana							2 ++				
*Cyperus eragrostis							++ +++				
Lycopus australis							3 ++ +				
*Myosotis laxa							1+ +1+				
*Rorippa nasturtiumaquaticum							+ + ++				
Polygonum minus							+ ++1++				
*Rumex conglomeratus							+++ +++				

Acacia longifolia		1		1				2+32+			
Acacia verticillata		+			2	3		1+32+		2 2 + 2	++
Hydrocotyle sibthorpioides				+			+		++		
Baumea juncea									23		
Mentha diemenica							+		++		
Melaleuca ericifolia		+ 1 3+		+ +	55	33	55 554	4555555	52	5+ 55 342	242+
Centella cordifolia								2	++	12++22121	++++
*Hypochoeris radicata			+	+		11	++	+ +		+ ++ 1++	+++
Microlaena stipoides				+						2 + 221	1221
Gonocarpus tetragynus			+							+1211	+112
Casuarina paludosa										444	+ 2
Leptocarpus brownii		2			2				12	1 3 2	
Lobelia alata		+		1 1				+	12	11+111	
Gahnia trifida		23 +						21	21	2+ 2 232	
Hemarthria uncinata										11+ 2 +	+
Goodenia humilis					2				+	2 23222	+
Baumea acuta										2 314212	
Schoenus tesquorum										3 4452	
Lepidosperma longitudinale					22					5 43 1	
Gonocarpus micranthus					1					+ 111 1	
Melaleuca squarrosa					33		+			+434	
Selaginella uliginosa										+1 1211	
Eucalyptus viminalis			1	2 2		3				+22 +	
Empodisma minus										1222	
Epacris impressa										122	+
Epacris microphylla										2 +	
Schoenus brevifolius										32	
Lindsaea linearis										12	+ +
Lepidosperma filiforme										+ 12	
Bossiaea prostrata										12	+++1
Eucalyptus ovata										+	3232
Stipa rudis										2	2143
Senecio glomeratus		+						+			+++
Acacia stricta				+1							++++
Gahnia radula											3411
Deyeuxia quadriseta								+		+	++ +
Schoenus apogon											++ 1
Danthonia laevis											+22
Drosera peltata										+	+++

ALPINE WET HEATH : SUB-COMMUNITY SCG 1.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Astelia alpina	100	1	Gentianella diemensis	80	+	Lycopodium fastigiatum	60	+
Empodisma minus	100	1	Craspedia sp. 'O'	80	+	Isolepis aucklandica	60	+
Epacris paludosa	100	1	Euphrasia gibbsiae	80	1	Callistemon sieberi	60	1
Olearia algida	100	1	Thelymitra venosa	80	1	Carex appressa	60	1
Richea continentis	100	1	Poa hiemata	60	+	Epilobium gunnianum	60	+
Sphagnum spp.	100	2	Asperula gunnii	60	+	Leptospermum grandifolium	60	+
Baeckea utilis	80	+	Carpha nivicola	60	1	Ranunculus collinus	60	+
Blechnum pennamarina	80	+	Hydrocotyle algida	60	+			

NO. OF SITES: 5 STRUCTURE: Closed-heath

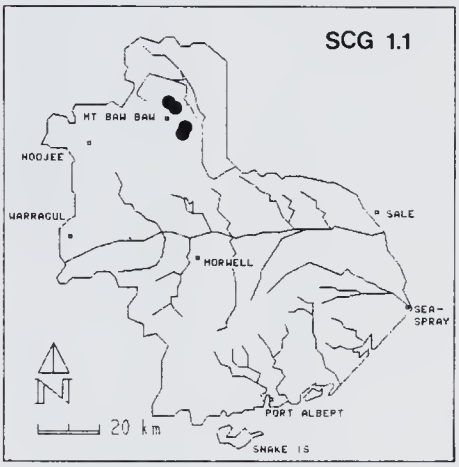
DISTRIBUTION: Scattered throughout the Baw Baw Plateau.

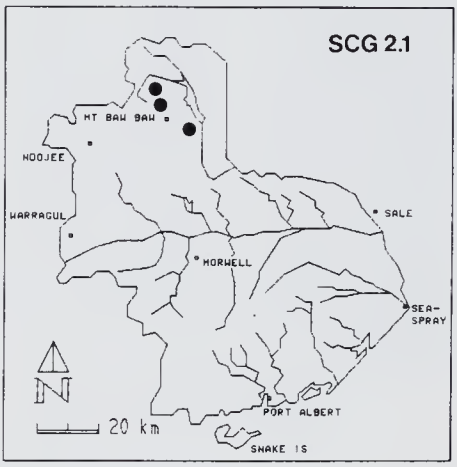
ENVIRONMENT: Cool and usually waterlogged depressions on snowfields of the high country. The soil is generally very organic, most of which is dead and dying Sphagnum spp.

ALTITUDE: Mean = 1398m, Highest = 1480m, Lowest = 1310m

MEAN FLORISTIC RICHNESS: 26 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: The Baw Baw Plateau is one of the few Victorian alpine regions which are not subject to cattle grazing. As such it provides an opportunity for comparison with important alpine grazing lands such as the Bogong High Plains. If, as is often suggested, cattle severely damage the Wet Heath, then it is probable that this can be recognised in a change in floristics. From a comparison of the florisics of SCG 1.1 with that of sub-community 7A of McDougall (1982), however, it is difficult to determine whether the differences between these sub-communities can be attributed to the different environments in which they are found or their different grazing regimes.





ALPINE HEATH : SUB-COMMUNITY SCG 2.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
*Cerastium fontanum	100	+	Luzula australasica	75	1	*Acetosella vulgaris	75	+
Hydrocotyle algida	100	1	Carex breviculmis	75	1	Viola hederacea	75	1
*Hypochoeris radicata	100	1	Olearia phlogopappa	75	1	Poa hiemata	75	1
Oreomyrrhis eriopoda	100	1	Orites lancifolia	75	+			
Senecio gunnii	100	+	*Poa pratensis	75	1			

NO. OF SITES: 4 STRUCTURE: Open-heath

DISTRIBUTION: Scattered throughout the Baw Baw Plateau.

ENVIRONMENT: Shallow, rocky soils on the edges of the depressions which support Alpine Wet Heath and usually adjacent to the Snow Gum Woodlands.

ALTITUDE: Mean = 1347m, Highest = 1380m, Lowest = 1320m

MEAN FLORISTIC RICHNESS: 23 species per site MEAN WEED COMPOSITION: 19% of species, 18% of cover

NOTES: A number of the prominent species of this sub-community (Olearia phlogopappa, Hydrocotyle algida, Pultenaea muelleri) are also components of the Snow Gum Woodlands of the Baw Baw Plateau and are common in other subalpine regions. Conversely the common shrubs of other alpine heath regions (e.g. Grevillea australis, Kunzea muelleri, Hovea longifolia) are not present in SCG 2.1. Consequently is it perhaps more reasonable to consider SCG 2.1 as a subalpine vegetation which lacks a tree canopy rather than a true alpine heath.

SNOW GUM WOODLAND : SUB-COMMUNITY SCG 3.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Eucalyptus pauciflora	100	4	Poa labillardieri	80	3	Tasmannia xerophila	60	2
Olearia phlogopappa	100	2	Nothofagus cunninghamii	60	2	Hydrocotyle algida	60	1
Pultenaea muelleri	100	1	Polystichum proliferum	60	1	Stylidium graminifolium	60	2
Viola hederacea	100	2	Senecio linearifolius	60	+	Trochocarpa clarkei	60	1
Gonocarpus montanus	80	1	Uncinia compacta	60	1			

NO. OF SITES: 7 STRUCTURE: Low open-forest

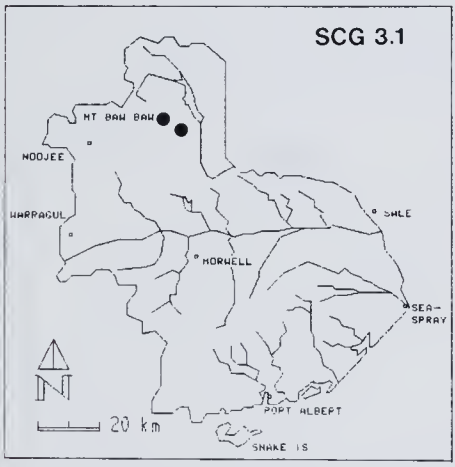
DISTRIBUTION: Scattered on slopes both on and around the Baw Baw Plateau.

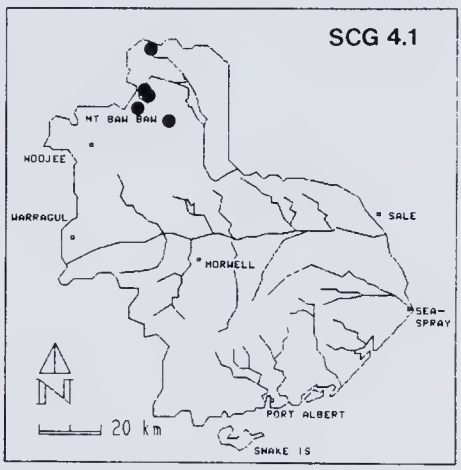
ENVIRONMENT: Exposed slopes and ridges which surround the waterlogged depressions supporting Alpine Wet Heath. Soils are shallow and rocky, temperatures are generally low, snowfalls are often heavy in winter.

ALTITUDE: Mean = 1364m, Highest = 1400m, Lowest = 1250m

MEAN FLORISTIC RICHNESS: 21 species per site MEAN WEED COMPOSITION: 1% of species, 0% of cover

NOTES: Although there are floristic affinities between the Snow Gum Woodlands of the Baw Baw Plateau and those of other Victorian subalpine regions there are some significant and interesting differences. For example, the pea Pultenaea muelleri is one of the dominant understorey shrubs in SCG 3.1 but is common nowhere else in the subalps. In other Snow Gum Woodlands further east Oxylobium alpestre or P. juniperina are the dominant understorey peas. The scrambling shrub, Wittsteinia vacciniacea, a species which is endemic to the Plateau and nearby regions, is also common in SCG 3.1.





SUBALPINE RIPARIAN SCRUB : SUB-COMMUNITY SCG 4.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Leucopogon maccraei	100	2	Geranium potentilloides	71	1	Carex appressa	57	2
Olanella tasmanica	100	1	Nothofagus cunninghamii	71	1	Oxalis magellanica	57	1
Olearia phlogopappa	100	1	Coprosma hirtella	71	1	Leucopogon gelidus	57	1
Leptospermum grandifolium	86	1	Hydrocotyle algida	71	1	Cotula filicula	57	1
Polystichum proliferum	86	1	Wittsteinia vacciniacea	71	1	Tasmannia xerophila	57	1
Polyscias sambucifolius	86	1	Stylidium graminifolium	71	1	Luzula campestris	57	1
Poa australis spp. agg.	86	1	Gahnia sieberiana	57	+	Oreomyrrhis eriopoda	57	1
Acaena anserinifolia	71	1	Ranunculus plebeius	57	1	Trochocarpa clarkei	57	1
Coprosma nitida	71	1	Acacia dealbata	57	1	Viola hederacea	57	+

NO. OF SITES: 5 STRUCTURE: Closed-scrub

DISTRIBUTION: Scattered in high country between Baw Baw Plateau and Matlock.

ENVIRONMENT: Gullies and watercourses of the subalps.

ALTITUDE: Mean = 1078m, Highest = 1350m, Lowest = 950m

MEAN FLORISTIC RICHNESS: 43 species per site MEAN WEED COMPOSITION: 5% of species, 5% of cover

NOTES: An unusual vegetation where Nothofagus cunninghamii, usually a large tree of protected montane gullies, grows as a bushy shrub in dense thickets (up to 10m high) with Leptospermum grandifolium. Although these two species are from distinctly different families, in this environment they are physiognomically similar, and together dominate the vegetation.

MONTANE SCLEROPHYLL WOODLAND : SUB-COMMUNITY SCG 5.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Cassinia aculeata	100	1	Senecio linearifolius	78	1	Eucalyptus dives	67	1
Dianella tasmanica	100	1	Stylidium graminifolium	78	1	Gnaphalium japonicum	67	+
Eucalyptus radiata	100	1	Tetrarrhena juncea	78	2	*Hypochoeris radicata	67	+
Poa australis spp. agg.	100	2	Clematis aristata	78	+	Viola hederacea	67	1
Pteridium esculentum	100	1	Lagenifera stipitata	78	1	Stellaria pungens	67	1
Acacia mucronata	89	1	Gonocarpus tetragynus	78	1	Asperula pusilla	56	+
Acaena anserinifolia	89	1	Lomandra longifolia	78	1	Hydrocotyle algida	56	+
Geranium potentilloides	89	1	Senecio quadridentatus	78	+	Pomaderris aspera	56	1
Polystichum proliferum	89	1	Polyscias sambucifolius	78	+	*Rubus fruticosus spp. agg.	56	+
Acacia dealbata	89	1	Pultenaea juniperina	67	1	Epacris impressa	56	2
Daviesia ulicifolia	78	1	Oxalis corniculata	67	+	Oeyeuxia rodwayi	56	1
Eucalyptus cypellocarpa	78	1	Acacia melanoxylon	67	1	Eucalyptus viminalis	56	1
Luzula campestris	78	+	Chiloglottis gunnii	67	+			
Rubus parvifolius	78	1	Coprosma quadrifida	67	1			

NO. OF SITES: 6 STRUCTURE: Open-forest to Low open-forest

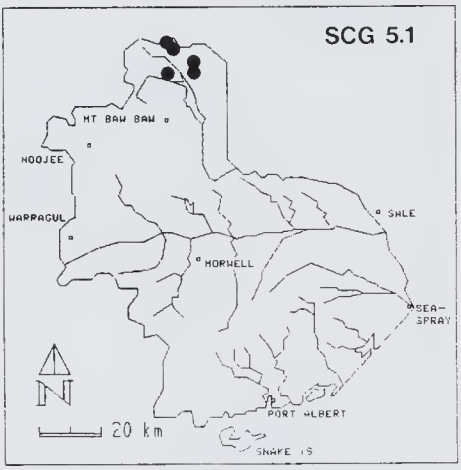
DISTRIBUTION: Mountain slopes north of the Baw Baw Plateau.

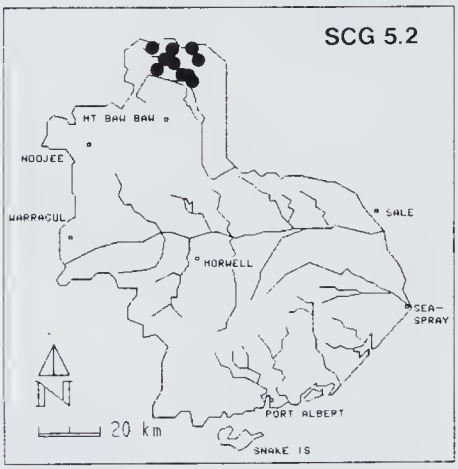
ENVIRONMENT: High altitude, well-drained, often rocky soils.

ALTITUDE: Mean = 895m, Highest = 1050m, Lowest = 760m

MEAN FLORISTIC RICHNESS: 51 species per site MEAN WEED COMPOSITION: 6% of species, 3% of cover

NOTES: SCG 5.1 and SCG 5.2 are the two most floristically rich sub-communities of the study area. SCG 5.1 occurs in slightly less exposed hillsides, and as a result supports some mesophytic species which are not characteristic of SCG 5.2 (e.g. Polystichum proliferum, Acacia melanoxylon, Clematis aristata).





MONTANE SCLEROPHYLL WOODLAND : SUB-COMMUNITY SCG 5.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Acacia mucronata	100	1	Poa australis spp. agg.	100	1	Persoonia confertiflora	83	1
Daviesia ulicifolia	100	2	Tetratheca ciliata	100	1	Dianella tasmanica	67	1
Dianella revoluta	100	1	Eucalyptus cypellocarpa	83	1	Cassytha melantha	67	1
Epacris impressa	100	2	Monotoca scoparia	83	2	Dillwynia retorta	67	2
Eucalyptus dives	100	2	Pteridium esculentum	83	+			
Gonocarpus tetragynus	100	1	Stylidium graminifolium	83	1			

NO. OF SITES: 10 STRUCTURE: Open-forest to Low open-forest

DISTRIBUTION: Mountain slopes north of the Baw Baw Plateau.

ENVIRONMENT: High altitude, well-drained, often rocky soils on exposed ridges.

ALTITUDE: Mean = 808m, Highest = 1050m, Lowest = 450m

MEAN FLORISTIC RICHNESS: 54 species per site MEAN WEED COMPOSITION: 5% of species, 3% of cover

NOTES: SCG 5.2 is, floristically, the richest sub-community in the study area and, by virtue of its wide range of flowering species, is one of the most attractive. The exposed and dry nature of the environment in which it is found means that many of the mesophytic species common in SCG 5.1 are replaced by small-leafed, sclerophyllous species in SCG 5.2 (e.g. Monotoca scoparia, Dillwynia retorta).

COOL TEMPERATE RAINFOREST : SUB-COMMUNITY SCG 6.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Asplenium bulbiferum	100	+	Microsorium diversifolium	89	1	Blechnum wattsii	67	1
Dicksonia antarctica	100	4	Polystichum proliferum	78	1	Hedycarya angustifolia	67	1
Nothofagus cunninghamii	100	2	Atherosperma moschatum	78	1	Cyathea marcescens	56	+
Fieldia australis	89	1	Australina muelleri	78	+	Cassinia trinerva	56	+
Grammitis billardieri	89	+	Rumohra adiantiformis	78	1	Cyathea cunninghamii	56	+

NO. OF SITES: 09 STRUCTURE: Closed-forest

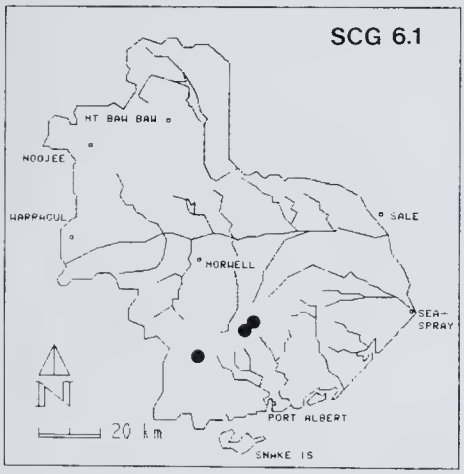
DISTRIBUTION: Central Strzelecki Ranges.

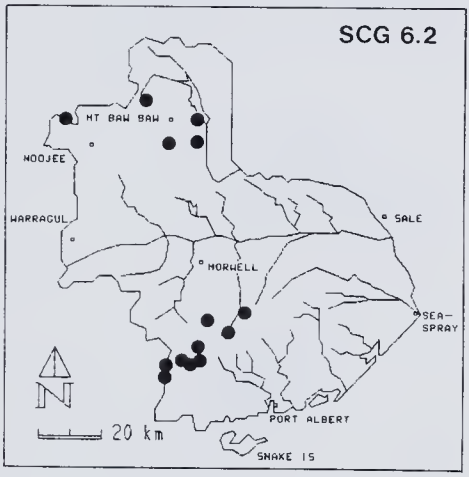
ENVIRONMENT: Wet, protected gullies at high elevations of the ranges.

ALTITUDE: Mean = 504m, Highest = 610m, Lowest = 410m

MEAN FLORISTIC RICHNESS: 19 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: This sub-community is floristically similar to Nothofagus-dominated cool temperate rainforest in other parts of the state, with a few notable exceptions. One is Fieldia australis, the only Victorian epiphytic dicotyledon, a species restricted to Gippsland and uncommon in Nothofagus-dominated cool temperate rainforest outside the Strzelecki Ranges. The others are Cyathea cunninghamii and C. marcescens, both tree ferns of restricted distribution and absent from the extensive cool temperate rainforest of the central highlands. The latter species is possibly a hybrid between C. cunninghamii and C. australis as it only grows in areas where the two species occur and is apparently sterile.





COOL TEMPERATE RAINFOREST : SUB-COMMUNITY SCG 6.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Dicksonia antarctica	100	2	Blechnum wattsii	76	1	Histiopteris incisa	62	+
Clematis aristata	95	1	Hedycarya angustifolia	71	1	Nothofagus cunninghamii	62	1
Cyathea australis	86	2	Microsorium diversifolium	71	+	Acacia melanoxylon	57	2
Polystichum proliferum	81	1	Grammitis billardieri	67	+	Asplenium bulbiferum	57	1
Eucalyptus regnans	81	2	Olearia argophylla	67	1	Tetrarrhena juncea	52	2
Acacia dealbata	76	1	Hydrocotyle hirta	62	+	Rumohra adiantiformis	52	1
Australina muelleri	76	1	Coprosma quadrifida	62	1			

NO. OF SITES: 21 STRUCTURE: Closed-forest to Tall open-forest

DISTRIBUTION: Scattered through the Strzelecki Ranges and around southern parts of the Central Highlands near the Baw Baw Plateau.

ENVIRONMENT: Gullies and protected slopes in wet, mountainous areas.

ALTITUDE: Mean = 536m, Highest = 1150m, Lowest = 150m

MEAN FLORISTIC RICHNESS: 31 species per site MEAN WEED COMPOSITION: 3% of species, 2% of cover

NOTES: This sub-community represents an ecotone between the true cool temperate rainforest of deep, protected gullies (SCG 6.1) and wet sclerophyll forest of mountain slopes (SCG 7.1). Accordingly, it occupies an environment intermediate between the two and supports species which are characteristic of both.

WET SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 7.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Clematis aristata	91	1	Geranium potentilloides	67	1	Histiopteris incisa	55	+
Coprosma quadrifida	88	1	Acaena anserinifolia	67	+	Stellaria flaccida	53	1
Polystichum proliferum	81	1	Pomaderris aspera	66	2	Australina muelleri	52	1
Pteridium esculentum	81	+	Dicksonia antarctica	64	1	Lepidosperma elatius	43	1
Tetrarrhena juncea	81	1	Cassinia aculeata	62	1	Hedycarya angustifolia	43	1
Hydrocotyle hirta	78	+	Prostanthera lasianthos	62	1	*Rubus fruticosus spp. agg.	40	1
Viola hederacea	76	1	Olearia lirata	62	1	Blechnum wattsii	38	1
Cyathea australis	76	1	Senecio linearifolius	59	1	Prunella vulgaris	36	+
Acacia dealbata	74	1	Olearia argophylla	59	1	Correa lawrenciana	36	1
Eucalyptus regnans	71	2	Olearia phlogopappa	57	1	*Hypochoeris radicata	36	+
Acacia melanoxylon	69	1	Sambucus gaudichaudiana	57	+			

NO. OF SITES: 58 STRUCTURE: Tall open-forest

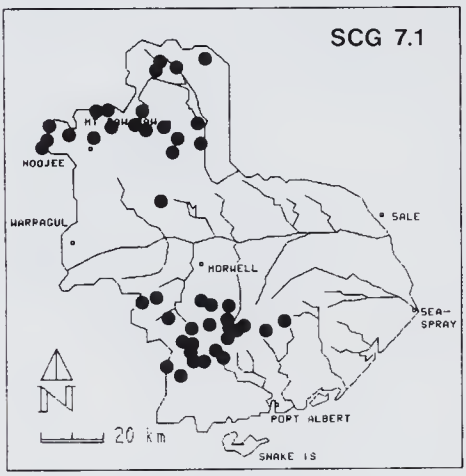
DISTRIBUTION: Scattered throughout the Strzelecki Ranges and southern parts of the Central Highlands.

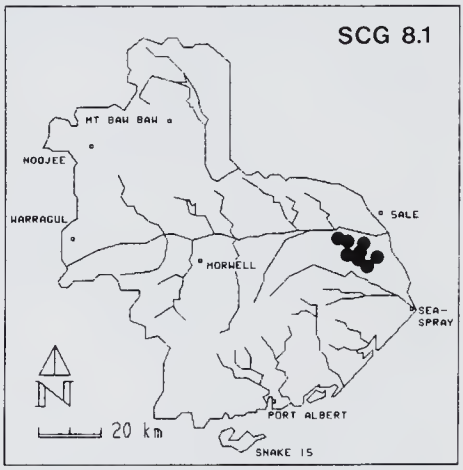
ENVIRONMENT: Deep, loamy soils (kraznozems) on wet, highland slopes.

ALTITUDE: Mean = 487m, Highest = 1000m, Lowest = 110m

MEAN FLORISTIC RICHNESS: 34 species per site MEAN WEED COMPOSITION: 6% of species, 4% of cover

NOTES: This sub-community, which is dominated by Eucalyptus regnans (Mountain Ash), is much less common in the Strzelecki Ranges than it was originally. This is due to an intensive clearing program by the early settlers. Clearing, timber production and the devastating 1939 fires (which burnt much of the forests in the Central Highlands) have meant that there are few mature stands of this type of forest in the study area.





DRY SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 8.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Pimelea humilis	80	1	Kunzea ericoides	70	2	Eucalyptus globoidea	60	3
Pteridium esculentum	80	3	Gramineae spp.	70	1	Lepidosperma concavum	60	1

NO. OF SITES: 10 STRUCTURE: Open-forest

DISTRIBUTION: Scattered in the Holey Plains area.

ENVIRONMENT: Loamy soils on slopes near watercourses.

ALTITUDE: Mean = 122m, Highest = 150m, Lowest = 80m

MEAN FLORISTIC RICHNESS: 14 species per site MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: The low floristic richness and the dense swards of Pteridium esculentum and Gahnia radula which characterise SCG 8.1 suggest a history of disturbance. SCG 8.1 is the only sub-community in the study area which has Eucalyptus globoidea and Leptospermum phylicoides as character species.

DRY SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 8.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Eucalyptus consideniana	100	3	Gahnia radula	78	2	Pimelea humilis	67	+
Lomandra filiformis	100	1	Monotoca scoparia	67	1	Gramineae spp.	67	1
Pteridium esculentum	78	2	Hibbertia acicularis	67	+			

NO. OF SITES: 9 STRUCTURE: Open-forest

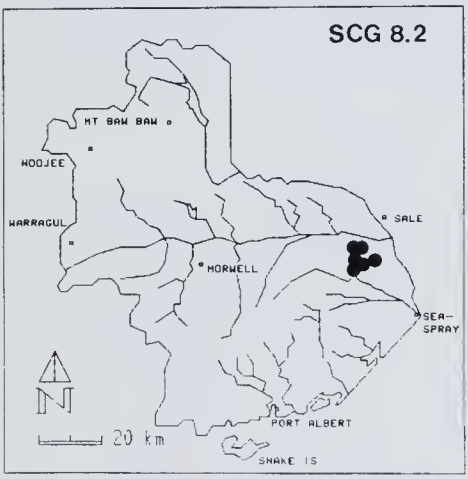
DISTRIBUTION: Scattered around Holey Plains.

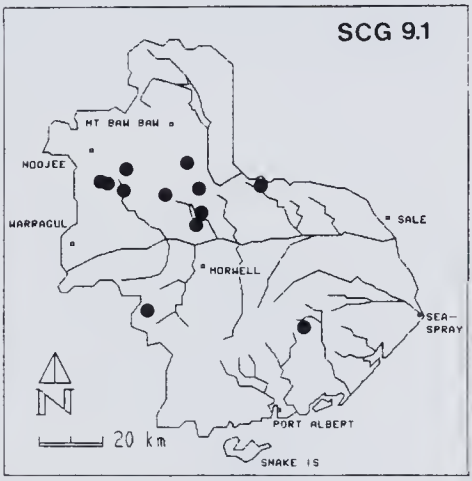
ENVIRONMENT: Sandy-loam soils on inland plains.

ALTITUDE: Mean = 126m, Highest = 190m, Lowest = 90m

MEAN FLORISTIC RICHNESS: 15 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: The low floristic richness and the dense swards of Pteridium esculentum and Gahnia radula in SCG 8.2 suggest a history of disturbance. If this is the case then it is probable that many of the species that have been lost are those which are characteristic of SCG 9.1, SCG 10.2 or SCG 10.3. These sub-communities are the only ones in the study area in which Eucalyptus consideniana is a character species and which support the other character species of SCG 8.2.





DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Acacia mucronata	100	1	Burchardia umbellata	80	1	Lindsaea linearis	60	1
Gonocarpus tetragynus	93	1	Drosera peltata	67	+	Viola hederacea	60	1
Pultenaea gunnii	93	1	Eucalyptus obliqua	67	1	Cassinia aculeata	60	+
Tetrarrhena juncea	93	1	Goodenia ovata	67	1	Amperea xiphoclada	53	1
Epacris impressa	93	1	Poa australis spp. agg.	67	1	Dianella revoluta	53	1
Gahnia radula	87	2	Pteridium esculentum	67	1	Billardiera scandens	53	+
Lomandra filiformis	87	1	Xanthorrhoea minor	67	1	Cassinia longifolia	53	1
Eucalyptus consideniana	87	1	*Hypochoeris radicata	67	+			
Leptospermum juniperinum	80	1	Lomandra longifolia	60	+			

NO. OF SITES: 14 STRUCTURE: Open-forest

DISTRIBUTION: Scattered throughout the southern parts of the Central Highlands, with two isolated occurrences in the Strzelecki Ranges.

ENVIRONMENT: Sandy-loam soils on well-drained sites in undulating country, often on northern or north-westerly slopes.

ALTITUDE: Mean = 265m, Highest = 400m, Lowest = 140m

MEAN FLORISTIC RICHNESS: 42 species per site MEAN WEED COMPOSITION: 3% of species, 1% of cover

NOTES: The understorey of SCG 9.1 is the most sclerophyllous of all the Damp Sclerophyll Forest sub-communities in the study area. The presence of E. consideniana and the preponderance of small-leafed shrubs demonstrate a floristic affinity with the Leptospermum myrsinoides Heath sub-communities.

DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Gonocarpus tetragynus	92	+	Eucalyptus radiata	69	2	Viola hederacea	64	+
Epacris impressa	83	+	Leptospermum juniperinum	67	1	*Hypochoeris radicata	58	+
Gahnia radula	83	2	Lomandra filiformis	67	1	Cassinia aculeata	47	+
Eucalyptus obliqua	81	2	Lomandra longifolia	67	+	Amperea xiphoclada	47	1
Pteridium esculentum	78	2	Acacia mucronata	64	1	Microlaena stipoides	44	+
Tetrarrhena juncea	72	2	Billardiera scandens	64	+			

NO. OF SITES: 36 STRUCTURE: Open-forest

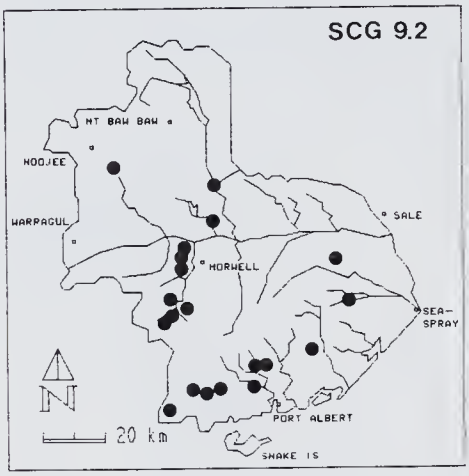
DISTRIBUTION: Scattered through the foothills of the Central Highlands and the Strzelecki Ranges.

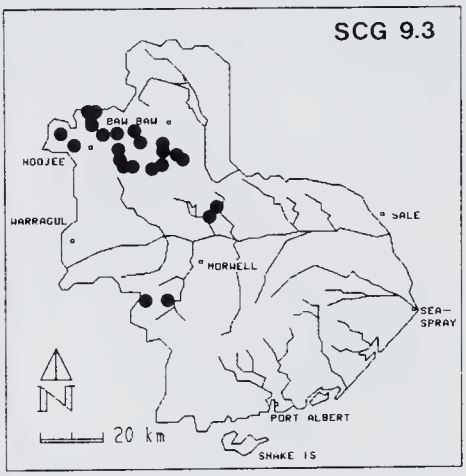
ENVIRONMENT: Sandy-loam soils on well-drained sites in undulating country.

ALTITUDE: Mean = 141m, Highest = 400m, Lowest = 5m

MEAN FLORISTIC RICHNESS: 27 species per site MEAN WEED COMPOSITION: 4% of species, 2% of cover

NOTES: The principal difference between SCG 9.1 and SCG 9.2 is the presence of E. consideniana in the former and the lower mean species richness of the latter. One feature of both sub-communities, although more pronounced in SCG 9.2, is the occasional dense stands of E. sieberi. This tree species is natural to the area, and after severe disturbance, such as wildfires and clear-felling, often becomes dominant over a floristically poor understorey.





DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Eucalyptus obliqua	100	1	Coprosma quadrifida	79	1	Gahnia sieberiana	54	1
Pteridium esculentum	96	1	Cyathea australis	75	1	Polyscias sambucifolius	54	1
Tetrarrhena juncea	96	2	Acacia mucronata	71	1	Culcita dubia	54	1
Viola hederacea	96	1	Acacia verticillata	71	1	Hydrocotyle hirta	54	+
Eucalyptus cypellocarpa	89	1	Acacia dealbata	68	1	*Hypochoeris radicata	54	+
Gonocarpus teucrioides	89	1	Eucalyptus radiata	68	1	Prostanthera lasianthos	50	1
Pomaderris aspera	86	1	Pultenaea juniperina	64	1	Tetratheca ciliata	50	1
Cassinia aculeata	86	1	Lepidosperma elatius	64	1	*Rubus fruticosus spp. agg.	50	1
Goodenia ovata	86	1	Pimelea axiflora	64	1	Oxalis corniculata	46	+
Olearia lirata	86	1	Platylobium formosum	61	2	Geranium potentilloides	54	1
Clematis aristata	82	1	Blechnum nudum	61	1			

NO. OF SITES: 28 STRUCTURE: Open-forest

DISTRIBUTION: Scattered through the Central Highlands, with two sites in the Strzelecki Ranges near Darlimurla.

ENVIRONMENT: Well-drained, loamy soils on moist and sheltered hillsides.

ALTITUDE: Mean = 331m, Highest = 700m, Lowest = 120m

MEAN FLORISTIC RICHNESS: 43 species per site MEAN WEED COMPOSITION: 3% of species, 2% of cover

NOTES: As many of the Wet Sclerophyll Forests of the study area have been cleared or were burnt in the 1939 bushfires (and are presently immature) the Damp Sclerophyll Forests of the high country have become the most important sources of timber in the south and central Gippsland region. Often, as a response to logging and fuel-reduction burns, the understorey of SCG 9.3 becomes dominated by one or two opportunistic plant species (e.g. Platylobium formosum, Culcita dubia, Tetrarrhena juncea).

DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Pteridium esculentum	96	1	Cassinia aculeata	70	+	Poa australis spp. agg.	56	1
Viola hederacea	89	+	Microlaena stipoides	70	+	Lomandra longifolia	56	1
Eucalyptus obliqua	85	3	Lomandra filiformis	70	+	Gahnia radula	56	1
Gonocarpus tetragynus	85	+	Billardiera scandens	67	+	Hypericum gramineum	56	+
Eucalyptus radiata	81	2	Clematis aristata	63	+	Epacris impressa	52	+
Tetrarrhena juncea	74	1	Senecio hispidulus	63	+	Goodenia ovata	48	+
*Hypochoeris radicata	74	+	Deyeuxia quadriseta	63	+			
Lagenifera stipitata	74	1	Acaena anserinifolia	59	+			

NO. OF SITES: 26 STRUCTURE: Open-forest

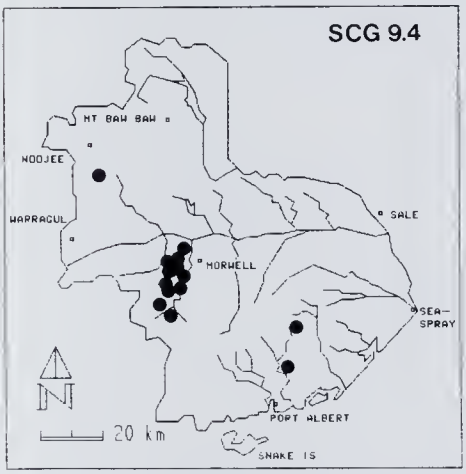
DISTRIBUTION: Concentrated around the Driffield area, with scattered occurrences south of the Strzelecki Ranges and one site near Neerim Junction.

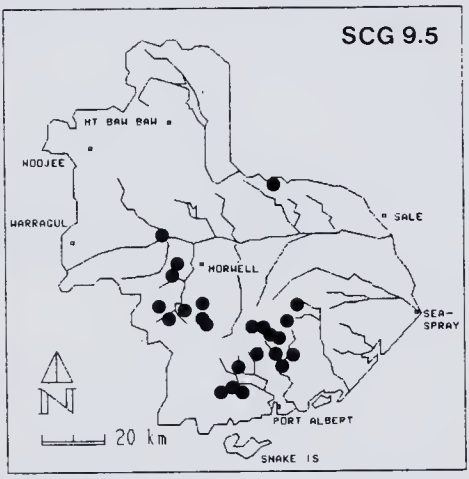
ENVIRONMENT: Moist, loamy soils on lowland hills.

ALTITUDE: Mean = 179m, Highest = 300m, Lowest = 30m

MEAN FLORISTIC RICHNESS: 35 species per site MEAN WEED COMPOSITION: 10% of species, 7% of cover

NOTES: Like most of the Damp Sclerophyll Forest in this region SCG 9.4 has suffered from logging and burning in the past. The understorey consists almost entirely of small, rapidly growing, opportunistic species and is dominated by a few aggressive fire weeds (e.g. Pteridium esculentum, Gahnia radula, Tetrarrhena juncea).





DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.5

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Clematis aristata	87	+	Poa australis spp. agg.	56	2	Eucalyptus muelleriana	46	2
Microlaena stipoides	83	+	Acaena anserinifolia	52	+	Echinopogon ovatus	42	+
Viola hederacea	77	+	Veronica calycina	52	+	Dichondra repens	42	+
Pteridium esculentum	71	1	Wahlenbergia quadrifida	50	+	Eucalyptus cypellocarpa	42	3
*Hypochoeris radicata	65	+	Tetrarrhena juncea	48	1	Senecio lautus	40	+
Coprosma quadrifida	62	1	Lagenifera stipitata	48	+	Acacia melanoxylon	40	1
Geranium potentilloides	58	+	Cassinia aculeata	48	+	Olearia lirata	40	1
Helichrysum dendroideum	58	1	Goodenia ovata	48	1	Hydrocotyle hirta	37	+
Oxalis corniculata	56	+	Gonocarpus tetragynus	46	+	Hypericum gramineum	37	+

NO. OF SITES: 49 STRUCTURE: Open-forest

ENVIRONMENT: Moist but well-drained loamy soils on lowland hills.

ALTITUDE: Mean = 189m, Highest = 555m, Lowest = 30m

MEAN FLORISTIC RICHNESS: 33 species per site MEAN WEED COMPOSITION: 10% of species, 6% of cover

NOTES: In places where Pteridium esculentum and Tetrarrhena juncea do not dominate the understorey SCG 9.5 forms an attractive, open vegetation. The understorey is often dominated by tussock grasses with only sparse shrub cover and the canopy consists of tall Eucalyptus globulus, E. viminalis and E. muelleriana. SCG 9.5 is the only subcommunity in the study area supporting E. globulus.

DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.6

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Clematis aristata	93	+	Tetrarrhena juncea	79	+	Helichrysum dendroideum	64	2
Coprosma quadrifida	93	+	*Rubus vestitus	79	+	Geranium potentilloides	57	+
Viola hederacea	86	+	Hydrocotyle hirta	71	+	Polystichum proliferum	57	+
Acacia melanoxylon	79	2	Stellaria flaccida	71	+	Poa labillardieri	57	1
Pteridium esculentum	79	+	Microlaena stipoides	71	+			

NO. OF SITES: 14 STRUCTURE: Open-forest

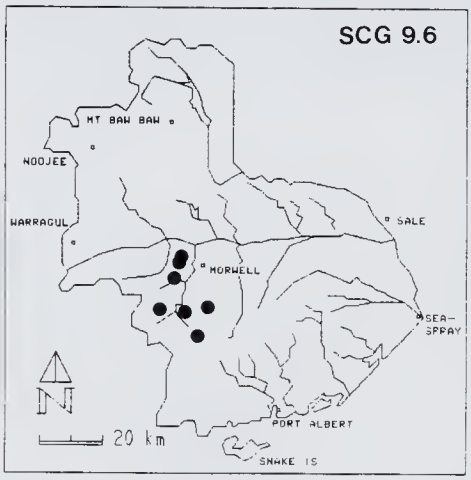
DISTRIBUTION: Concentrated in the Driffield area, with scattered occurrences in the foothills of the Strzelecki Ranges.

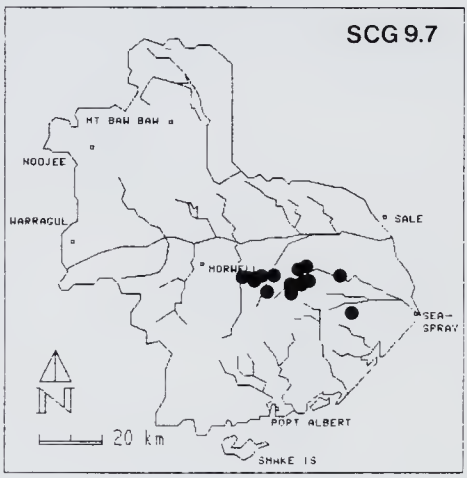
ENVIRONMENT: Moist but well-drained soils on the lower slopes and gullies of lowland hills.

ALTITUDE: Mean = 168m, Highest = 300m, Lowest = 110m

MEAN FLORISTIC RICHNESS: 32 species per site MEAN WEED COMPOSITION: 10% of species, 8% of cover

NOTES: SCG 9.6 is one of the few forests of the region in which an understorey tree species (in this case Acacia melanoxylon) is a more consistent and dominant part of the canopy than the major eucalypts.





DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.7

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Pteridium esculentum	97	3	Lagenifera stipitata	58	1	Acrotriche serrulata	52	1
Poa australis spp. agg.	94	2	Leptospermum juniperinum	58	1	Bossiaea cinerea	48	1
*Hypochoeris radicata	94	1	Eucalyptus consideniana	58	3	Gramineae spp.	48	1
Epacris impressa	79	2	Lomandra longifolia	58	1	Pterostylis spp.	48	1
Gonocarpus tetragynus	64	1	Pimelea linifolia	55	1	Acianthus exsertus	45	1
Gahnia radula	61	2	Opercularia varia	55	1			
Lomandra filiformis	61	2	Senecio gunnii	52	1			

NO. OF SITES: 33 STRUCTURE: Open-forest

DISTRIBUTION: Concentrated north of the Strzelecki Ranges, between Traralgon and Merriman Creeks, with outlying occurrences at Holey Plains and south of Monkey Creek.

ENVIRONMENT: Relatively flat areas on sandy-loam soils.

ALTITUDE: Mean = 166m, Highest = 230m, Lowest = 80m

MEAN FLORISTIC RICHNESS: 26 species per site MEAN WEED COMPOSITION: 8% of species, 7% of cover

NOTES: This sub-community occurs in ecologically and geographically similar sites to those supporting SCG 10.3 (Leptospermum myrsinoides Heathland). The two sub-communities share many species although L. myrsinoides does not dominate the understorey of SCG 9.7.

DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.8

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Gonocarpus tetragynus	100	1	Acrotriche serrulata	80	1	Gahnia radula	60	2
*Hypochoeris radicata	100	1	Eucalyptus radiata	80	3	Hypericum gramineum	60	1
Poa australis spp. agg.	100	3	Pterostylis spp.	80	1	Leptospermum juniperinum	60	2
Pteridium esculentum	100	2	Lomandra filiformis	70	1	Lomandra longifolia	60	1
Epacris impressa	80	1	Eucalyptus viminalis	60	2			

NO. OF SITES: 10 STRUCTURE: Open-forest

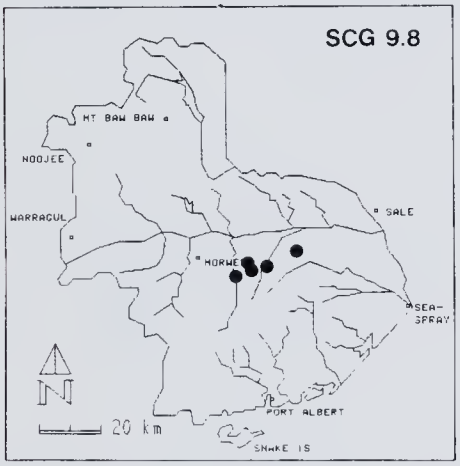
DISTRIBUTION: Concentrated north of the Strzelecki Ranges around Traralgon Creek, with isolated occurrences near Cormandale and Flynn Creek.

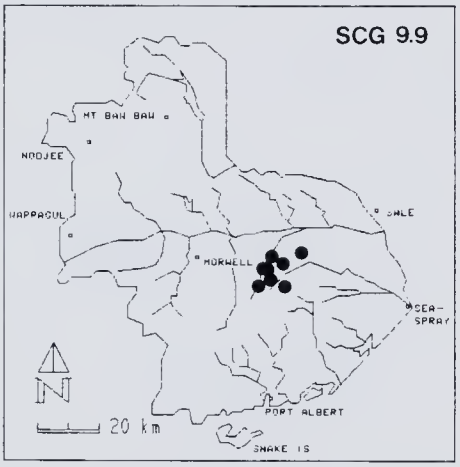
ENVIRONMENT: Relatively flat areas on loam to clay-loam soils.

ALTITUDE: Mean = 123m, Highest = 180m, Lowest = 70m

MEAN FLORISTIC RICHNESS: 26 species per site MEAN WEED COMPOSITION: 8% of species, 6% of cover

NOTES: The soils in SCG 9.8 are heavier than those of SCG 9.7 and the former lacks those species which are also common in Leptospermum myrsinoides Heathland and indicative of sandy soils. The high cover values for species such as Pteridium esculentum, Gahnia sieberiana and Leptospermum juniperinum in SCG 9.8 suggests a history of disturbance.





DAMP SCLEROPHYLL FOREST : SUB-COMMUNITY SCG 9.9

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Eucalyptus radiata	94	3	Pteridium esculentum	81	2	Leptospermum juniperinum	69	2
Poa australis spp. agg.	81	2	*Hypochoeris radicata	75	1	Gonocarpus tetragynus	63	1

NO. OF SITES: 16 STRUCTURE: Open-forest

DISTRIBUTION: Concentrated north of the Strzelecki Ranges, between Flynn and Merriman Creeks.

ENVIRONMENT: Relatively flat areas on loam to clay-loam soils.

ALTITUDE: Mean = 148m, Highest = 300m, Lowest = 80m

MEAN FLORISTIC RICHNESS: 19 species per site MEAN WEED COMPOSITION: 11% of species, 9% of cover

NOTES: SCG 9.9 is the most disturbed and species poor representative of this community. It is likely that heavy grazing pressure and occasional fires are the main disturbance factors.

Leptospermum myrsinoides HEATHLAND : SUB-COMMUNITY SCG 10.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Monotoca scoparia	84	1	Leucopogon ericoides	56	1	Lomandra longifolia	47	1
Pteridium esculentum	83	3	Lomandra filiformis	55	1	Gonocarpus tetragynus	47	1
Epacris impressa	78	1	Amperea xiphoclada	53	1	Leptospermum juniperinum	45	1
Bossiaea cinerea	69	1	Banksia marginata	51	1	Caustis pentandra	44	1
Banksia serrata	67	2	Acacia oxycedrus	51	1	Hibbertia acicularis	44	1
Eucalyptus nitida	60	2	Leptospermum myrsinoides	49	2	Dillwynia glaberrima	42	1

NO. OF SITES: 54 STRUCTURE: Closed-heath to Open-forest

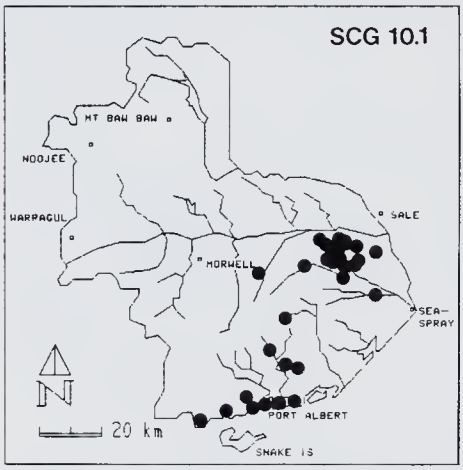
DISTRIBUTION: Concentrated around Holey Plains, with scattered occurrences south of the Strzelecki Ranges and along the coast west from Tarra River.

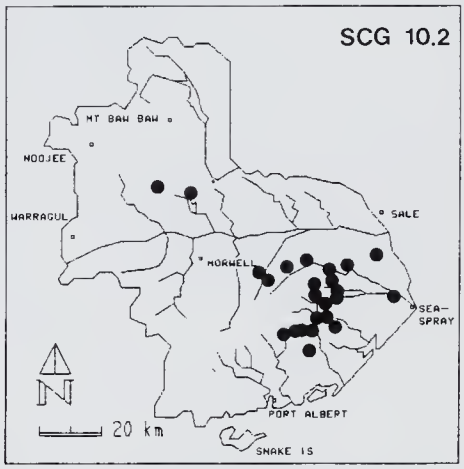
ENVIRONMENT: Flat or undulating areas on deep siliceous sands.

ALTITUDE: Mean = 102m, Highest = 200m, Lowest = 5m

MEAN FLORISTIC RICHNESS: 16 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: This is the least species rich of the sub-communities of Community 10 and is the only one in which Eucalyptus nitida is a character species. The presence of this species and others such as Caustis pentandra and Xanthorrhoea australis, creates a superficial similarity between SCG 10.1 and some of the woodlands in the Grampians.
In the southern region, particularly Gellions Run, the major tree species is E. viminalis.





Leptospermum myrsinoides HEATHLAND : SUB-COMMUNITY SCG 10.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Epacris impressa	90	1	Monotoca scoparia	68	1	Banksia marginata	61	1
Leptospermum myrsinoides	77	2	Bossiaea cinerea	68	1	Lomandra filiformis	61	1
Leptospermum juniperinum	74	1	Hibbertia acicularis	68	1	Gonocarpus tetragynus	58	1
Eucalyptus consideniana	71	2	Banksia serrata	65	2	Acacia oxycedrus	55	1
Gahnia radula	71	2	Amperea xiphoclada	65	1	Dillwynia glaberrima	48	1
Pteridium esculentum	68	2	Xanthorrhoea minor	61	1	Lomandra longifolia	48	1

NO. OF SITES: 31 STRUCTURE: Closed-heath to Open-forest

DISTRIBUTION: Occurs mainly around the eastern foothills of the Strzelecki Ranges, with two isolated sites in the southern foothills of the Baw Baw Plateau.

ENVIRONMENT: Flat or undulating areas on deep siliceous sands.

ALTITUDE: Mean = 162m, Highest = 300m, Lowest = 40m

MEAN FLORISTIC RICHNESS: 24 species per site MEAN WEED COMPOSITION: 2% of species, 2% of cover

NOTES: The differences between SCG 10.2 and SCG 10.3 are only minor and the two sub-communities represent different ends of a subtle continuum. Perhaps the most significant difference between the two is the relative scarcity of Banksia serrata in SCG 10.3.

Leptospermum myrsinoides HEATHLAND : SUB-COMMUNITY SCG 10.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Epacris impressa	93	1	Leptospermum juniperinum	65	2	*Hypochoeris radicata	47	1
Pteridium esculentum	90	2	Monotoca scoparia	63	1	Banksia serrata	44	2
Gonocarpus tetragynus	78	1	Poa australis spp. agg.	61	2	Banksia marginata	44	1
Bossiaea cinerea	78	2	Lomandra longifolia	54	1	Tetratheca pilosa	43	1
Gahnia radula	69	1	Correa reflexa	54	1	Pimelea linifolia	42	1
Amperea xiphoclada	67	1	Dillwynia glaberrima	53	1	Xanthorrhoea minor	39	1
Leptospermum myrsinoides	67	2	Lomandra filiformis	53	1	Hibbertia acicularis	38	1
Eucalyptus consideniana	66	2	Leucopogon virgatus	49	1			

NO. OF SITES: 116 STRUCTURE: Closed-heath to Open-forest

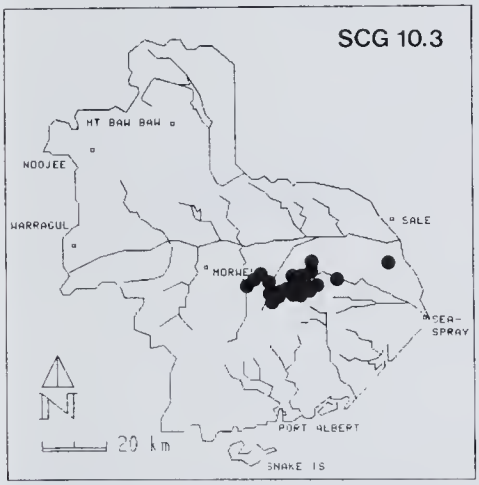
DISTRIBUTION: Concentrated on the northern side of the Strzelecki Ranges in the vicinity of Traralgon, Flynn and Merriman Creeks.

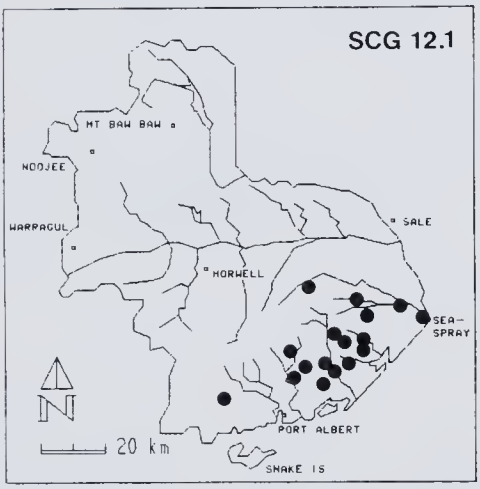
ENVIRONMENT: Flat or undulating areas on deep siliceous sands.

ALTITUDE: Mean = 172m, Highest = 310m, Lowest = 70m

MEAN FLORISTIC RICHNESS: 22 species per site MEAN WEED COMPOSITION: 3% of species, 2% of cover

NOTES: Community 10 represents the largest area of Leptospermum myrsinoides Heathland in Victoria. SCG 10.3 is the largest stand of this community in the study area. There are only subtle differences between SCG 10.3 and SCG 10.2 and most significant of these is the lower abundance of Banksia serrata in the former.





GRASSY WOODLAND : SUB-COMMUNITY SCG 12.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Lomandra filiformis	75	1	Eucalyptus bridgesiana	65	1	Xanthorrhoea minor	60	1
Oxalis corniculata	75	+	Pimelea humilis	65	1	Hypericum gramineum	55	1
Pteridium esculentum	70	2	Eucalyptus muelleriana	60	2	Poa australis spp. agg.	55	1
Microlaena stipoides	70	1	Gahnia radula	60	2	Tricoryne elatior	55	+
Dichondra repens	65	1	Astroloma humifusum	60	+	Bossiaea prostrata	50	+
Lomandra longifolia	65	1	Poranthera microphylla	60	+	*Centaurium tenuiflorum	50	+

NO. OF SITES: 20 STRUCTURE: Open-forest

DISTRIBUTION: Occurs mainly on lowland areas south and east of the Strzelecki Ranges.

ENVIRONMENT: Flat or undulating inland areas on well- drained loamy soils.

ALTITUDE: Mean = 63m, Highest = 170m, Lowest = 20m

MEAN FLORISTIC RICHNESS: 32 species per site MEAN WEED COMPOSITION: 6% of species, 3% of cover

NOTES: SCG 12.1 is the least disturbed of the community 12 sub-communities. This is perhaps because it grows on slightly more sandy soil than the rest of the community and is less suitable for pasture improvement. Its natural flora is made up of more sclerophyllous species and fewer grasses and herbs than that of SCG 12.2 to 12.4 so it is also less suitable for grazing.
SCG 12.1 is one of only two sub-communities in the study area in which Eucalyptus muelleriana is a character species.

GRASSY WOODLAND : SUB-COMMUNITY SCG 12.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
*Hypochoeris radicata	96	1	Lagenifera stipitata	69	1	Eucalyptus viminalis	54	2
Poa australis spp. agg.	92	2	Gonocarpus tetragynus	65	1	Leptospermum juniperinum	54	1
Pteridium esculentum	88	3	*Holcus lanatus	65	2	Gramineae spp.	50	1
Hydrocotyle laxiflora	77	1	Hypericum gramineum	62	1	Senecio gunnii	50	1
Eucalyptus radiata	77	3	Poranthera microphylla	54	1	Acrotriche serrulata	50	1
Pimelea linifolia	73	1	Dichondra repens	54	1			

NO. OF SITES: 24 STRUCTURE: Open-forest to woodland

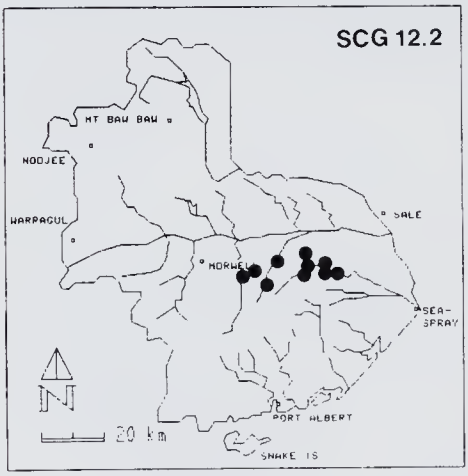
DISTRIBUTION: Scattered to the north of the Strzelecki Ranges between Traralgon and Merriman Creeks.

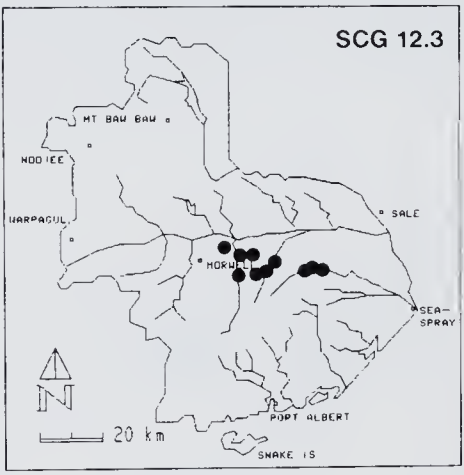
ENVIRONMENT: Flat or gently undulating areas on clay- loam soils.

ALTITUDE: Mean = 119m, Highest = 210m, Lowest = 70m

MEAN FLORISTIC RICHNESS: 26 species per site MEAN WEED COMPOSITION: 15% of species, 13% of cover

NOTES: Much of the land on which this vegetation grows has been subject to a long history of grazing and pasture improvement. The natural vegetation occurs in small pockets rather than large continuous stands and supports significant populations of introduced species, most of which are of pastoral origin.





GRASSY WOODLAND : SUB-COMMUNITY SCG 12.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
*Hypochoeris radicata	100	2	*Cynosurus echinatus	74	1	Gramineae spp.	56	2
*Holcus lanatus	91	2	Hydrocotyle laxiflora	68	2	Geranium solanderi	50	1
Oxalis corniculata	88	1	Poa australis spp. agg.	68	2	Lomandra filiformis	44	1
Eucalyptus radiata	82	3	Dichondra repens	65	1	Trifolium spp.	44	1
*Cirsium vulgare	76	1	*Stellaria media	62	2			
Pteridium esculentum	74	2	Eucalyptus viminalis	59	2			

NO. OF SITES: 34 STRUCTURE: Open-forest to woodland

DISTRIBUTION: Scattered to the north of the Strzelecki Ranges, extending from Traralgon Creek eastwards to Merriman Creek near Willung.

ENVIRONMENT: Flat or gently undulating areas on clay loam soils.

ALTITUDE: Mean = 125m, Highest = 220m, Lowest = 40m

MEAN FLORISTIC RICHNESS: 24 species per site MEAN WEED COMPOSITION: 38% of species, 33% of cover

NOTES: SCG 12.3 is the most disturbed and weed infested sub community in this study. Introduced grasses and herbs dominate the understorey in most places and most of the native species are opportunists. Like SCG 12.2 and SCG 12.4 the areas supporting SCG 12.3 are usually small and surrounded by pastures.

GRASSY WOODLAND : SUB-COMMUNITY SCG 12.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
*Hypochoeris radicata	93	1	Eucalyptus radiata	63	2	Eucalyptus viminalis	53	3
*Holcus lanatus	72	2	Dichondra repens	60	1	Hydrocotyle laxiflora	50	1
Poa australis spp. agg.	63	2	Senecio spp.	57	1			
Pteridium esculentum	63	2	*Conyza bonariensis	57	1			

NO. OF SITES: 30 STRUCTURE: Open-forest to Woodland

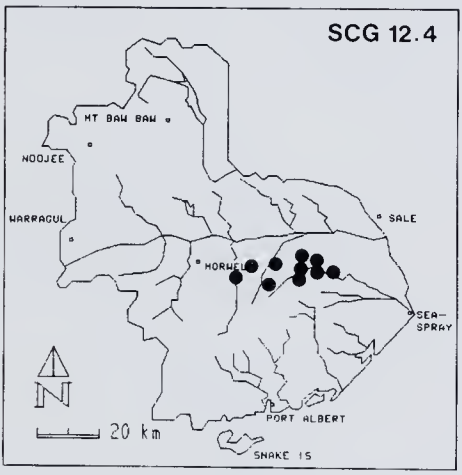
DISTRIBUTION: Scattered north of the Strzelecki Ranges, near Traralgon, Flynn and Merriman Creeks.

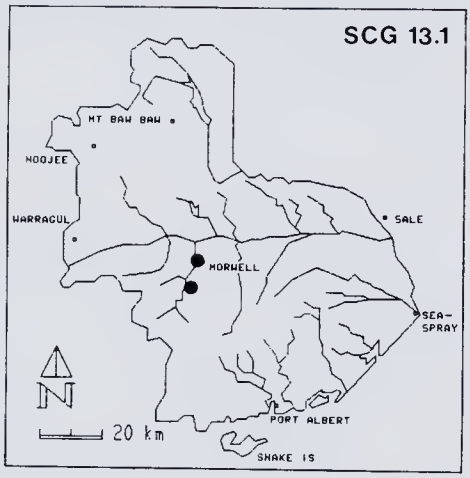
ENVIRONMENT: Sheltered boggy areas, or close to creeks and rivers. Soils often poorly drained clay-loams.

ALTITUDE: Mean = 96m, Highest = 180m, Lowest = 70m

MEAN FLORISTIC RICHNESS: 18 species per site MEAN WEED COMPOSITION: 22% of species, 20% of cover

NOTES: Although not as weedy a SCG 12.3, SCG 12.4 supports an understorey which is usually dominated by introduced grasses and herbs and opportunistic native species. Occasionally, in wet depressions, the understorey is dominated by dense thickets of Melaleuca ericifolia under a canopy of Eucalyptus ovata.





FRESHWATER MARSH : SUB-COMMUNITY SCG 13.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Lemna minor	100	1	Spirodela oligorrhiza	100	1	Triglochin procera	100	1

NO. OF SITES: 2 STRUCTURE: Herbland

DISTRIBUTION: Occurs along Morwell River.

ENVIRONMENT: Shallow still water.

ALTITUDE: Mean = 40m, Highest = 50m, Lowest = 30m

MEAN FLORISTIC RICHNESS: 7 species per site MEAN WEED COMPOSITION: 7% of species, 2% of cover

NOTES: The number of sites recorded for SCG 13.1 is an underestimate of its actual abundance. This species-poor, aquatic vegetation is found in a number of ponds and billabongs near the lower-altitude tributaries of the Morwell river.

FRESHWATER MARSH : SUB-COMMUNITY SCG 13.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Eleocharis sphacelata	100	2	Typha Spp.	67	3			
Triglochin procera	100	4	Potamogeton Spp.	67	4			

NO. OF SITES: 3 STRUCTURE: Closed-sedgeland

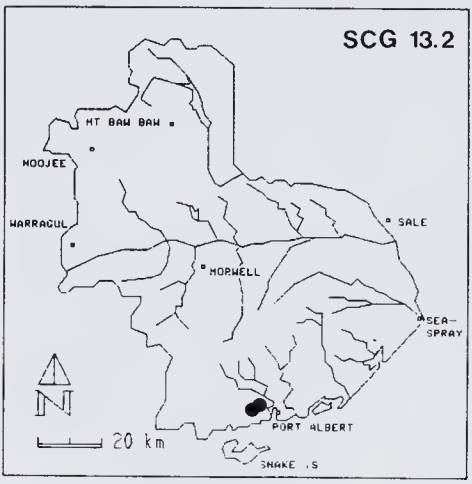
DISTRIBUTION: Gellion's Run near Gelliondale.

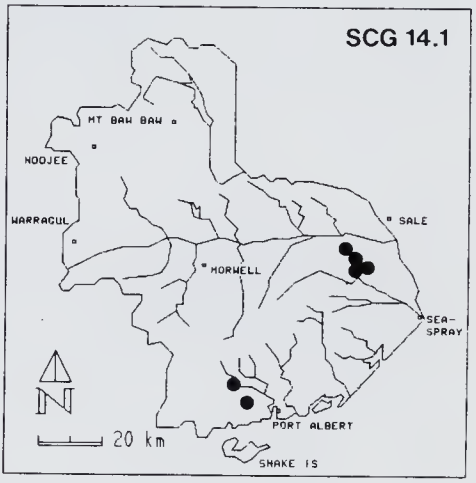
ENVIRONMENT: Freshwater ponds which develop on clay soils in otherwise poorly-drained, sandy areas.

ALTITUDE: Mean = 0m, Highest = 0m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 4 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: Like most aquatic sub-communities, SCG 13.2 is floristically poor and generally dominated by one or two species. Unlike SCG 13.1, SCG 13.2 plants are rooted in the substrate and have aerial shoots even though the ponds in which they grow generally contain water all year round.





COASTAL HEATHLAND : SUB-COMMUNITY SCG 14.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Empodisma minus	100	2	Melaleuca squarrosa	083	4	Leptocarpus tenax	67	3
Leptospermum juniperinum	83	2	Selaginella uliginosa	83	1			

NO. OF SITES: 6 STRUCTURE: Closed-heath

DISTRIBUTION: Scattered occurrences at Holey Plains and Gellion's Run.

ENVIRONMENT: Poorly drained sites, usually of clay and sand substrates. Water is often close to or above the soil surface.

ALTITUDE: Mean = 80m, Highest = 120m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 16 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: Melaleuca squarrosa and Leptospermum juniperinum dominate this vegetation and produce a very deep leaf litter. As a consequence few understorey species are common in the generally shaded and waterlogged substrate of SCG 14.1. The most successful of the understorey species are members of the Restionaceae and Cyperaceae.

COASTAL HEATHLAND : SUB-COMMUNITY SCG 14.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Leptospermum juniperinum	100	3	Xanthorrhoea resinosa	71	4	Lepidosperma filiforme	57	2
Selaginella uliginosa	100	2	Casuarina paludosa	64	1	Leptospermum myrsinoides	57	2
Dillwynia glaberrima	86	2	Dampiera stricta	64	1	Epacris microphylla	57	1
Epacris impressa	86	1	Schoenus tenuissimus	64	2	Hibbertia procumbens	57	1
Leptocarpus tenax	86	2	Eucalyptus viminalis	64	2	Xanthorrhoea minor	57	1
Schoenus brevifolius	86	3	Burchardia umbellata	57	+			
Lindsaea linearis	71	1	Empodisma minus	57	2			

NO. OF SITES: 14 STRUCTURE: Closed-heath

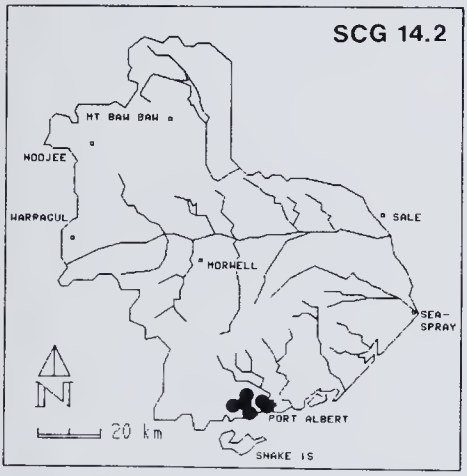
DISTRIBUTION: Scattered through and around Gellion's Run

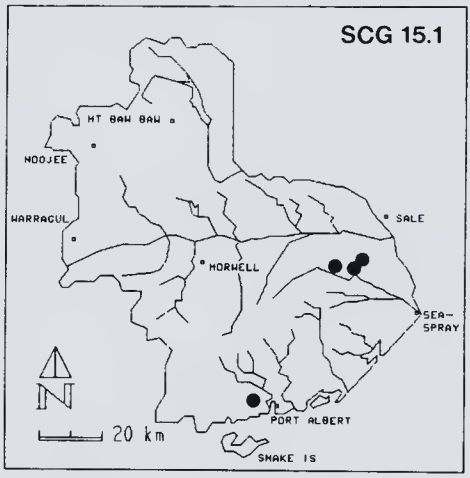
ENVIRONMENT: Damp depressions of near-coastal plains.

ALTITUDE: Mean = 5m, Highest = 68m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 29 species per site MEAN WEED COMPOSITION: 1% of species, 0% of cover

NOTES: The drier soils and lower densities of Melaleuca squarrosa and Leptospermum juniperinum than in SCG 14.1 correlate with a significantly higher floristic richness for SCG 14.2. This sub-community is a western representative of the 'grass-tree plain' vegetation which is best developed in East Gippsland (Forbes et al., 1982).





SEDGE SWAMPLAND : SUB-COMMUNITY SCG 15.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Lepidosperma longitudinale	100	4						

NO. OF SITES: 7 STRUCTURE: Closed-sedgeland

DISTRIBUTION: Holey Plains and Gellion's Run.

ENVIRONMENT: Damp depression on poorly-drained, often waterlogged clay soils.

ALTITUDE: Mean = 95m, Highest = 150m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 5 species per site MEAN WEED COMPOSITION: 2% of species, 1% of cover

NOTES: Lepidosperma longitudinale, like the related Eleocharis sphacelata (SCG 13.2), often grows in dense swards to the exclusion of all other ground cover species. It is probably the commonest sedge species of waterlogged ,clay soils in Victoria.

Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex fascicularis	100	1	Leptospermum lanigerum	100	2	Scirpus marginatus	100	1
*Centaurium tenuiflorum	100	+	Lilaeopsis polyantha	100	1	Villarsia reniformis	100	1
Helichrysum rosmarinifolium	100	2	Melaleuca ericifolia	100	5	Hydrocotyle spp.	100	2
Lepidosperma longitudinale	100	2	Melaleuca squarrosa	100	3			
Leptocarpus tenax	100	1	Phragmites australis	100	1			

NO. OF SITES: 2 STRUCTURE: Closed-scrub

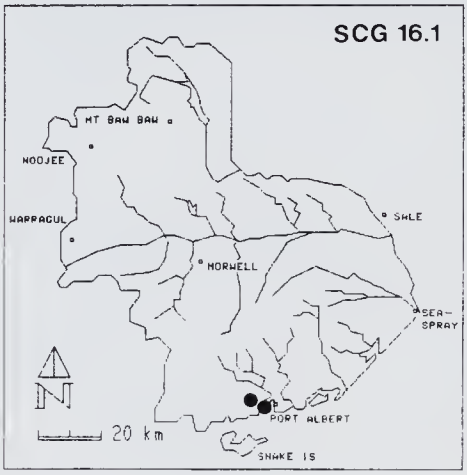
DISTRIBUTION: Gellion's Run near Alberton.

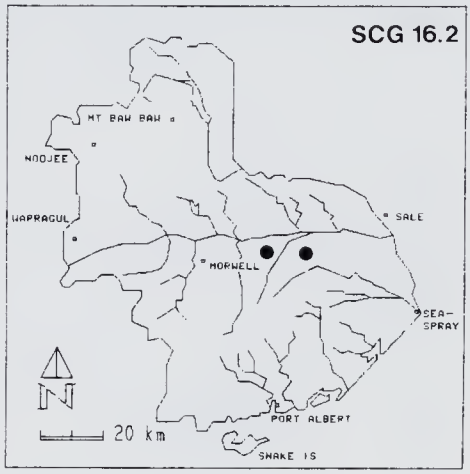
ENVIRONMENT: Poorly-drained sand-clay soils on flat or gently undulating land.

ALTITUDE: Mean = 0m, Highest = 0m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 17 species per site MEAN WEED COMPOSITION: 7% of species, 4% of cover

NOTES: Melaleuca squarrosa and M. ericifolia usually grow on quite different soil types (the former on waterlogged sands, the latter on heavier soils) but SCG 16.1 represents an unusual intermediate environment which is able to support both. As is usual for vegetation dominated by either of these species, the understorey of SCG 16.1 is open and made up principally of small herbaceous species.





Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Melaleuca ericifolia	100	3	*Hypochoeris radicata	67	1	Phragmites australis	67	2

NO. OF SITES: 2 STRUCTURE: Open-scrub to Closed-scrub

DISTRIBUTION: Both sites are in the Flynn's Creek area.

ENVIRONMENT: Damp depressions on poorly-drained clay soils in flat or gently undulating country.

ALTITUDE: Mean = 60m, Highest = 70m, Lowest = 50m

MEAN FLORISTIC RICHNESS: 11 species per site MEAN WEED COMPOSITION: 33% of species, 20% of cover

NOTES: Melaleuca ericifolia and Phragmites communis are common, opportunistic species on roadside verges, drains and damp depressions on alienated land. Sub-community SCG 16.2 is an example of this situation where much of the understorey is made up of introduced species and the overstorey is dominated by native trees and shrubs.

Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.3

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex appressa	89	+	*Cyperus eragrostis	67	+	*Myosotis laxa	56	+
*Rumex conglomeratus	89	+	Calystegia sepium	56	1	*Nasturtium officinale	56	+
Polygonum minus	78	1	Melaleuca ericifolia	56	5			

NO. OF SITES: 7 STRUCTURE: Closed-scrub to Sedgeland

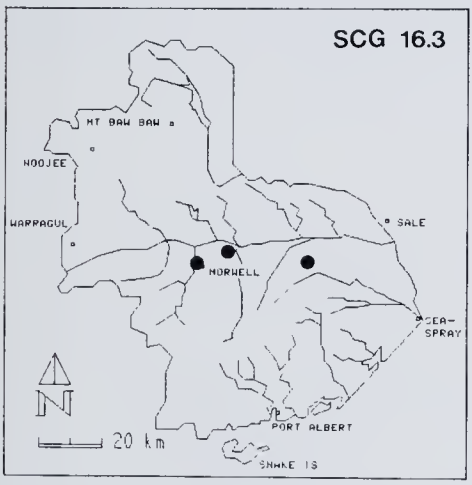
DISTRIBUTION: Morwell River near Morwell, south of the Latrobe River and west of Traralgon.

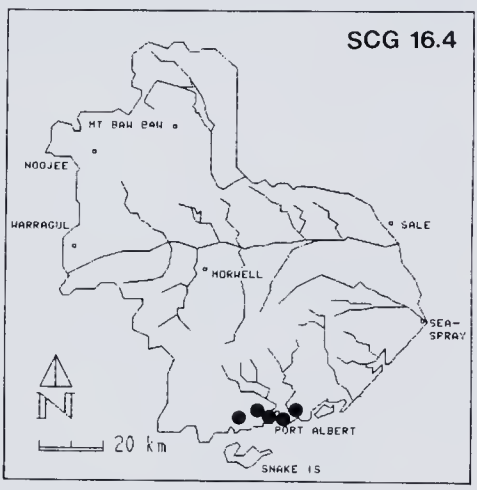
ENVIRONMENT: Disturbed areas of damp depressions, with poor drainage and clay soils.

ALTITUDE: Mean = 30m, Highest = 30m, Lowest = 30m

MEAN FLORISTIC RICHNESS: 19 species per site MEAN WEED COMPOSITION: 31% of species, 18% of cover

NOTES: This sub-community, like SCG 16.2, is one where the opportunistic native species Melaleuca ericifolia and Phragmites communis dominate a disturbed area of land with a ground cover consisting largely of introduced herbs and grasses.





Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.4

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Melaleuca ericifolia	100	5	Acacia longifolia	83	1	Disphyma clavellatum	83	1
Senecio lautus	83	1	Acacia verticillata	83	1	Rhagodia baccata	83	1

NO. OF SITES: 6 STRUCTURE: Closed-scrub

DISTRIBUTION: Coastal dunes between Port Welshpool and Port Albert.

ENVIRONMENT: Poorly-drained sands on coasts immediately inland from the salt spray zone.

ALTITUDE: Mean = 0m, Highest = 2m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 16 species per site MEAN WEED COMPOSITION: 13% of species, 8% of cover

NOTES: Melaleuca ericifolia dominates this species-poor sub-community which may be a disturbed version of SCG 21.2 (Coastal Banksia Woodland).

Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.5

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Mentha diemenica	100	+	Hydrocotyle sibthorpioides	100	+	Baumea juncea	100	2
Centella cordifolia	100	+	Leptocarpus brownii	100	1	Melaleuca ericifolia	100	3
Gahnia trifida	100	1	Lobelia alata	100	1	Samolus repens	100	1

NO. OF SITES: 2 STRUCTURE: Closed-scrub to Closed-herbfield

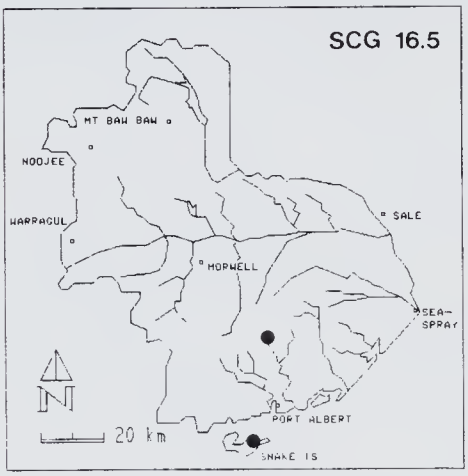
DISTRIBUTION: Restricted to Snake Island.

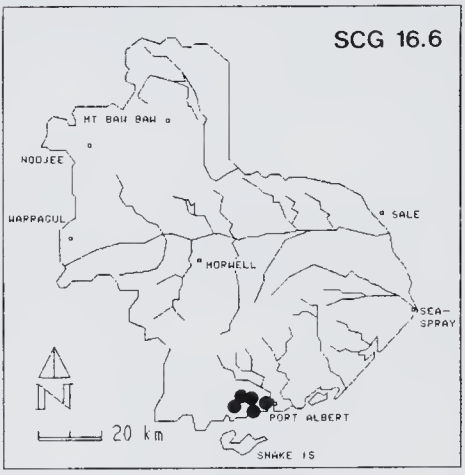
ENVIRONMENT: Poorly-drained mud-flats immediately inland from the salt marsh and subject to sea spray.

ALTITUDE: Mean = 1m, Highest = 2m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 16 species per site MEAN WEED COMPOSITION: 6% of species, 3% of cover

NOTES: SCG 16.5 usually grows adjacent to the salt marsh on Snake Island. However the lack of any salt-tolerant species in this sub-community suggests that the waterlogged soils are inundated with fresh water rather than sea water.





Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.6

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Centella cordifolia	100	1	Selaginella uliginosa	67	1	Lagenifera gracilis	56	1
Leptospermum juniperinum	89	2	Gahnia trifida	67	2	Schoenus tesquorum	56	3
Leptocarpus tenax	78	2	Gnaphalium spp.	67	1	Gonocarpus micranthus	56	1
Melaleuca ericifolia	78	3	*Hypochoeris radicata	67	+	Hemarthria uncinata	56	1
Baumea acuta	78	2	Lobelia alata	67	1	Microlaena stipoides	56	1
Goodenia humilis	67	2	Gonocarpus tetragynus	56	1			
Deyeuxia densa	67	1	*Centaurium tenuiflorum	56	+			

NO. OF SITES: 9 STRUCTURE: Closed-scrub

DISTRIBUTION: Concentrated in the region of Gellions Run to the South.

ENVIRONMENT: Poorly-drained, sandy-clay soils on flat or gently undulating terrain.

ALTITUDE: Mean = 0m, Highest = 5m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 31 species per site MEAN WEED COMPOSITION: 4% of species, 1% of cover

NOTES: This is the least weedy of the SCG 16 sub-communities. It grows in association with the Coastal Heathland of Gellions Run and consequently supports a number of species which are also characteristic of that vegetation. SCG 16.6 is the only sub-community in the region in which the relatively uncommon species Deyeuxia densa and Schoenus tesquorum are character species.

Melaleuca ericifolia SCRUB : SUB-COMMUNITY SCG 16.7

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Acacia stricta	100	+	Leptospermum juniperinum	100	2	Danthonia laevis	75	1
Bossiaea prostrata	100	+	Melaleuca ericifolia	100	2	Drosera peltata	75	+
Centella cordifolia	100	+	Microlaena stipoides	100	1	*Hypochoeris radicata	75	+
Eucalyptus ovata	100	2	Stipa nervosa	100	2	Poa australis spp. agg.	75	1
Gahnia radula	100	2	Oeyeuxia quadriseta	75	+	Senecio glomeratus	75	+
Gonocarpus tetragynus	100	1	Schoenus apogon	75	+			

NO. OF SITES: 5 STRUCTURE: Closed-scrub

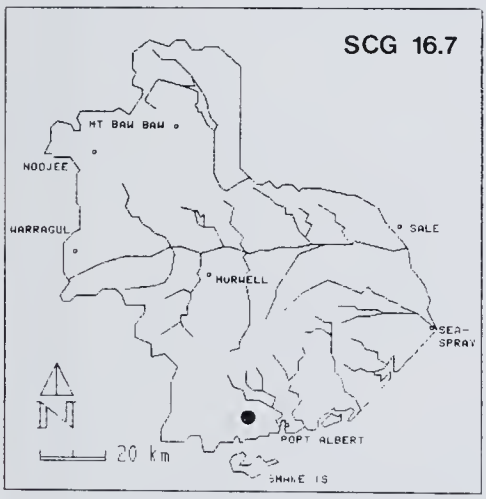
DISTRIBUTION: An isolated occurrence in the Hedley Range to the south.

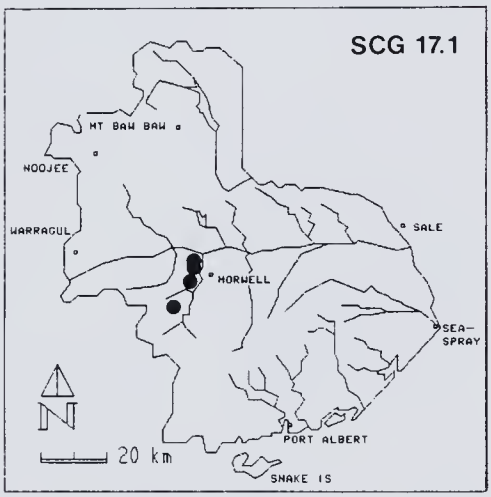
ENVIRONMENT: Poorly-drained, sandy-clay soils on hilly terrain.

ALTITUDE: Mean = 15m, Highest = 15m, Lowest = 15m

MEAN FLORISTIC RICHNESS: 36 species per site MEAN WEED COMPOSITION: 11% of species, 5% of cover

NOTES: Many of the M. ericifolia sub-communities are on disturbed land which supports a range of introduced, oportunistic plants. SCG 16.7, however, supports mainly native species and is quite floristically rich. Unlike other sub-communities of SCG 16 this sub-community is not entirely dominated by M. ericifolia even though its is a consistant and significant part of the canopy.





RIPARIAN SCRUB : SUB-COMMUNITY SCG 17.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Carex appressa	86	+	Poa tenera	71	1	Leptospermum juniperinum	57	2
Gratiola peruviana	86	+	Helichrysum dendroideum	71	+	Melaleuca squarrosa	57	3
Tetrarrhena juncea	86	+	Hydrocotyle tripartita	57	+	Isolepis inundata	57	+
Cyperus lucidus	71	1	Acacia melanoxylon	57	2			
Gnaphalium involucratum	71	+	Histiopteris incisa	57	+			

NO. OF SITES: 7 STRUCTURE: Low open-woodland to Closed Scrub

DISTRIBUTION: Foothills of the Strzelecki Ranges in the Driffield area.

ENVIRONMENT: Shallow and slow-running watercourses.

ALTITUDE: Mean = 111m, Highest = 150m, Lowest = 90m

MEAN FLORISTIC RICHNESS: 25 species per site MEAN WEED COMPOSITION: 12% of species, 8% of cover

NOTES: Riparian vegetation is often floristically very rich (e.g. Cullan et al., 1981), however SCG 17.1 is relatively poor in species. This is probably due to the clearing of native vegetation right up to the banks of local watercourses resulting in the destruction of many specialist waterside species.

RIPARIAN SCRUB : SUB-COMMUNITY SCG 17.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Blechnum minus	100	1	Leptospermum lanigerum	80	3	*Solanum nigrum	60	+
*Hypochoeris radicata	100	+	Baumea tetragona	80	2	*Sonchus oleraceus	60	+
Lobelia alata	100	+	Schoenus maschalinus	60	+	Viola hederacea	60	1
Melaleuca squarrosa	100	4	*Rubus vestitus	60	+	Blechnum nudum	60	+
Gonocarpus tetragynus	80	+	Gnaphalium involucratum	60	+	Empodisma minus	60	+
Gleichenia dicarpa	80	1	Juncus planifolius	60	+	Eucalyptus ovata	60	2
Hydrocotyle sibthorpioides	80	+	Leptospermum juniperinum	60	1	*Holcus lanatus	60	+
Hypericum japonicum	80	+	Isolepis inundata	60	+	Poa tenera	60	1

NO. OF SITES: 5 STRUCTURE: Low open-woodland to Closed Scrub

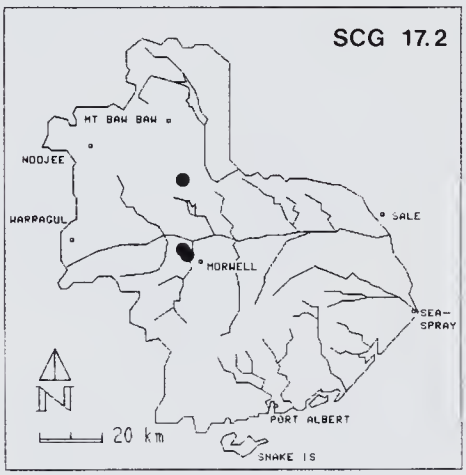
DISTRIBUTION: Mainly in the foothills of the Strzelecki Ranges between Yallourn and Narracan, with a single occurrence north of Mt. Tanjil.

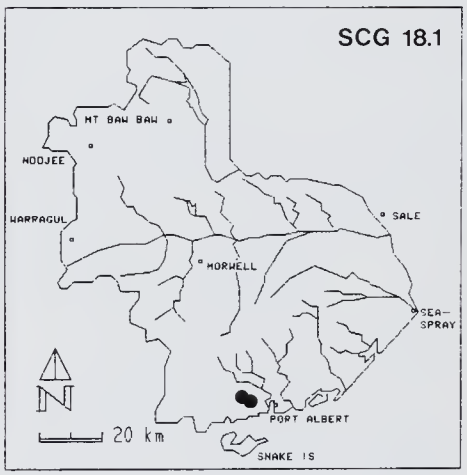
ENVIRONMENT: Shallow and slow-running streams.

ALTITUDE: Mean = 122m, Highest = 220m, Lowest = 60m

MEAN FLORISTIC RICHNESS: 35 species per site MEAN WEED COMPOSITION: 17% of species, 9% of cover

NOTES: SCG 17.2 is structurally similar to SCG 16.3, but Melaleuca squarrosa replaces M. ericifolia as the dominant species. The sandy, waterlogged soils support a wide variety of sedges.





UNCLASSIFIED : SUB-COMMUNITY SCG 18.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Melaleuca squarrosa	100	5	Sprengelia incarnata	66	2	Selaginella uliginosa	66	2
Leptospermum juniperinum	100	3	Leptocarpus tenax	66	2			

NO. OF SITES: 3 STRUCTURE: Closed-heath

DISTRIBUTION: Gellion's Run

ENVIRONMENT: Damp depressions of near-coastal plains.

ALTITUDE: Mean = 0m, Highest = 0m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 7 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: There are too few representatives of this vegetation to adequately classify it in this survey. However its floristic compositon and environment suggest that it may be a species-poor version of Community 14 (Coastal Heath).

MANGROVE : SUB-COMMUNITY SCG 19.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Avicennia marina	100	5						

NO. OF SITES: 2 STRUCTURE: Closed-heath to Closed-scrub

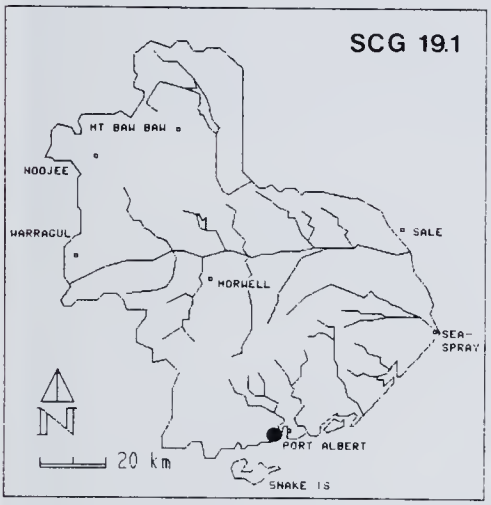
DISTRIBUTION: The coast west of Port Albert.

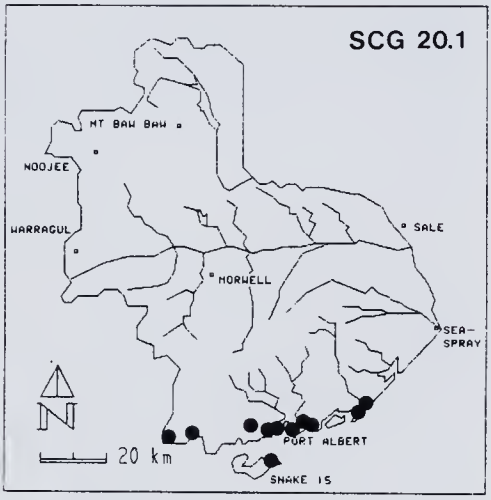
ENVIRONMENT: Coastal mudflats subject to regular tidal inundation. On the extreme seaward edge of the terrestrial vegetation.

ALTITUDE: Mean = 0m, Highest = 0m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 1 species per site MEAN WEED COMPOSITION: 0% of species, 0% of cover

NOTES: The mangrove vegetation is represented by only two sites in this study but it occupies about 30 to 40% of the coastline of Corner Inlet. It always grows in single species stands and forms what appears to be a buffer zone between the sea and the Salt Marsh (Community 20).





SALT MARSH : SUB-COMMUNITY SCG 20.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Sarcocornia quinqueflora	90	3	Distichlis distichophylla	57	2	Disphyma clavellatum	52	1

NO. OF SITES: 21 STRUCTURE: Open-heath to Closed-herbfield

DISTRIBUTION: Scattered along the mainland and island coasts.

ENVIRONMENT: Mudflats subject to tidal inundation.

ALTITUDE: Mean = 0m, Highest = 1m, Lowest = 0m

MEAN FLORISTIC RICHNESS: 9 species per site MEAN WEED COMPOSITION: 5% of species, 3% of cover

NOTES: The salt marsh of Corner Inlet will often cover extensive tracts of mudflats (e.g. Margaret Is.) but it is not as floristically rich and varied as the salt marsh of Western Port (see Bridgewater and Hughes 1974). It does, however, represent one of the largest areas of salt marsh in Southern Australia.

COASTAL BANKSIA WOODLAND : SUB-COMMUNITY SCG 21.1

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Banksia integrifolia	100	1	*Aira caryophyllea	67	1	Lomandra longifolia	67	1
Dichondra repens	100	1	Astroloma humifusum	67	+	Pteridium esculentum	67	5
Lepidosperma concavum	100	1	Carpobrotus rossii	67	+	Clematis microphylla	67	+
Leucopogon parviflorus	100	1	Gonocarpus teucrioides	67	1	Isoetopsis graminifolia	67	1
Senecio lautus	100	1	Hibbertia sericea	67	1	Isolepis nodosa	67	1

NO. OF SITES: 3 STRUCTURE: Low open-forest

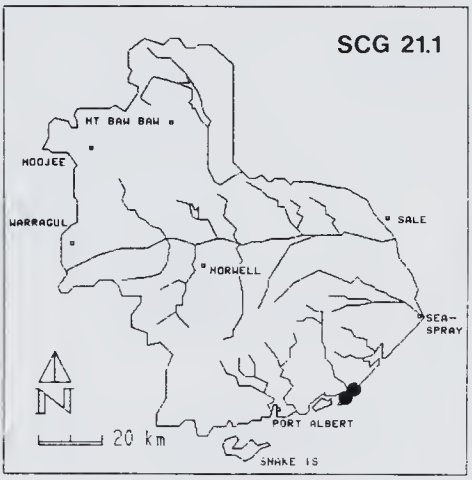
DISTRIBUTION: Coastal dunes at the mouth of Bruthen Ck., and and southward along the sandy promontory beside St. Margaret Island.

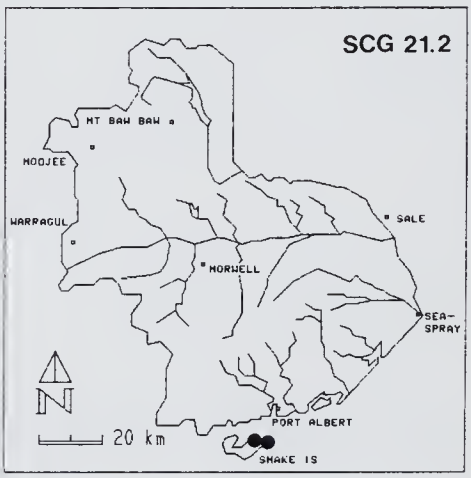
ENVIRONMENT: Calcareous sands inland from the primary dunes.

ALTITUDE: Mean = 4m, Highest = 5m, Lowest = 2m

MEAN FLORISTIC RICHNESS: 21 species per site MEAN WEED COMPOSITION: 10% of species, 8% of cover

NOTES: Much of the development in the study area has caused land to be cleared right up to the coastline and Coastal Banksia Woodland is consequently uncommon. There may be isolated occurrences at other coastal localities in the study area but these will be few. The reduction in this community is of particular importance to honeyeaters and other nectiferous animals. Banksia integrifolia (the main species in Coastal Banksia Woodland) flowers from early winter to spring and provides an important nectar supply at a time of year when the other banksias of the region are not flowering (B. serrata flowers in summer and B. marginata flowers from late summer to mid-winter).





COASTAL BANKSIA WOODLAND : SUB-COMMUNITY SCG 21.2

CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A	CHARACTER SPECIES	%FREQ	C/A
Banksia integrifolia	100	2	Galium propinquum	67	1	Rhagodia baccata	67	1
Dichondra repens	100	1	*Aira caryophyllea	67	1	Isolepis nodosa	67	1
Lepidosperma gladiatum	100	2	*Conyza bonariensis	67	1			
Poa australis spp. agg.	83	1	Lagenifera stipitata	67	+			

NO. OF SITES: 6 STRUCTURE: Low open-forest

DISTRIBUTION: Restricted to Snake Island, particularly near the coast.

ENVIRONMENT: Calcareous sands inland from the primary dunes.

ALTITUDE: Mean = 2m, Highest = 5m, Lowest = 1m

MEAN FLORISTIC RICHNESS: 21 species per site MEAN WEED COMPOSITION: 13% of species, 10% of cover

NOTES: Snake Island has been grazed and burnt in the past and the sub-community SCG 21.2 shows signs of this disturbance in the number of introduced and opportunistic species it supports. Nevertheless SCG 21.2 is extensive on the island and represents the largest stand of the community in the study area.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the access to raw data from G.C. Suckling, G.W. Carr, G.A. Parr-Smith, N.H. Scarlett, A.R.G. McMahon, J.R. Busby and D. Cheal. All these workers were helpful in a number of ways in clarifying problems associated with data transference and coding.

A number of other people helped collect and prepare data for the purposes of this report. Chief amongst these are Anne Opie, Susie van Berkel and Charlie Meredith, all of whom gave up time from their own work to assist in the field and the laboratory.

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GREVILLEA OBTECTA (PROTEACEAE), A NEW SPECIES FROM CENTRAL VICTORIA

by

W.M. Molyneux *

ABSTRACT

Molyneux, W.M. *Grevillea obtecta* (Proteaceae), a new species from central Victoria. *Muelleria* 6(1)147-151 (1985)—A new species of *Grevillea* R.Br. ex Knight, *G. obtecta,* is described, its affinities within the "aquifolium group" are discussed and notes on biology are given. The species is currently known from the Taradale—Daylesford area of Central Victoria.

TAXONOMY

Grevillea obtecta W.M. Molyneux, sp. nov.

Frutex prostratus, in amplitudini ad circiter 2.3 m, ramulis fragilibus, caulibus juvenilibus villosis. *Folia* variabilia, ascendentia vel erecta, simplicia vel profunde divisa, plerumque ovata vel obovata vel rhombiformia, 3-18 cm (praecipue 3-11 et 13.5-16) long, 1.5-8 cm (praecipue 1.5-5) lata, ad basin cuneata, attenuata; petioli 0-21 mm (praecipue 3-12) longi; lobi acuminati, 2-9 mm (praecipue 4-7) lati, simplices vel varie divisi, marginibus planis vel recurvatis, supra pilis sparsis (secundum venam mediam) aliquando praediti, subter pilis crispatis dispersis instructi; venae principales et secundariae, ut viduntur in superficiebus, prominentes. *Inflorescentiae* plerumque terminales, interdum in axibus vetustioribus, secundae, c. 3-6.5 cm longae. *Pedunculis et rhachibus* villosis. *Bracteae* conspicuae c. 5-12 mm longae, c 3-9 mm latae, in alabastro imbricatae, deciduae vel saepe persistentes. *Pedicelli* c. 2-3.5 mm longi, sparse villosi. *Perianthium* viride, c. 6 x 2 mm, externe laxe villosum. *Nectarium* prominens. *Stipes* c. 2 mm longus. *Ovario* villoso. *Stylo* glabro (praeter basin) 8-13 mm longo. *Pollinis-donor* obliquus. *Stigmate* prominenti.

Shrub to 2.3 m wide but usually c. 1 m, prostrate. *Branches* stout, brittle. *Stems* villous when young, becoming glabrous or sparingly villous with age. *Petiole* (0-)3-12(-21) mm long. *Leaves* variable, mostly ascending, crowded, subsessile to petiolate, 3-18 cm (usually either 3-11 or 13.5-16 cm) long including the petiole, 1.5-5(-8) cm wide, mostly ovate obovate or rhomboidal in outline, simple with irregularly serrate margin to pinnatifid or pinnatisect; base cuneate, tapered, a quarter to two-thirds of the total leaf length; margin recurved or flat; primary lobes (4-)7-13 per leaf, (2-)4-7(-9) mm wide, tapering to a sharp brittle point, simple or divided into secondary lobes which also taper to similar points; upper surface mostly glabrous except when young, or with a few scattered hairs along the midvein; lower surface with scattered curled or twisted hairs; venation on upper surface indented, the primary veins conspicuous, secondary veins less so; venation of lower surface raised and conspicuous. *Inflorescence* terminal, often displaced by a proximal branch, occasionally axial on old wood, or on a short branchlet arising on older wood, erect or decurved, secund, c. 3-6.5 cm long, bracteose. *Peduncle and rhachis* villous. *Bracts* imbricate, conspicuous, firmly attached, broadly to narrowly ovate, acute, concave, (5-)7-8(-12) mm long x (3-)5(-9) mm wide, deciduous at or during anthesis, or sometimes retained until flowers have withered; outer surface with central rib and longitudinal striations, mostly villous or if occasionally only sparsely hairy then mainly villous along edges; inner surface glabrous. *Pedicels* 2-3.5 mm long, sparsely covered with long twisted hairs. *Perianth* c. 6 mm long x 2 mm wide, loosely villous and green outside, glabrous and purple inside. *Torus* almost straight to oblique. *Nectary* prominent, ± U-shaped, c. 0.5-1.0 mm high, up to 0.5 mm thick; margin irregular. *Pistil* c. 12-16 mm long. *Stipe* c. 2 mm long, sparsely villous, attached toward the top of the torus. *Ovary* with mostly appressed long hairs. *Style* (8-)10-12(-13) mm long, sparsely hairy at base. *Pollen-presenter* oblique, c. 1.5-2 mm wide with a prominent stigma. *Fruit* ellipsoid with appressed hairs, opening to almost flat after dehiscence; style persistent. Flowering period Oct.—Dec.

Type Collection:

6 km SW. of Taradale, on north-westerly slopes above forest track, 1 km SW. of

*Belfast Road, Montrose, Victoria, Australia 3765.

Fig. 1. Inflorescence of *Grevillea obtecta*, showing the villous floral bracts still firmly attached during flowering.

Fig. 2. *Grevillea obtecta*, aborted bud showing the ribbing and villous margins of the floral bracts.

aqueduct, 37°09'S., 144°19'E. Fryers Range State Forest, Central Victoria, 2.xi.1977, W.M. Molyneux & S.G. Forrester (Holotype: MEL 665917. Isotypes: CANB, K, MEL 665918, NSW).

SELECTED SPECIMENS EXAMINED:

Victoria—5 km SW. of Taradale on the west side of aqueduct, Fryers Range State Forest, 2.xi.1977, *W.M. Molyneux & S.G. Forrester* (CANB, K, MEL 665921, NSW); 3.3 km along Wewak road after Middleton's Creek crossing, Upper Loddon State Forest 2.xi.1977, *W.M. Molyneux & S.G. Forrester* (CANB, K, MEL 665919, NSW); 14.6 km N. on the Porcupine Ridge Road from its junction with the Daylesford—Malmsbury Road,

Fig. 3. Diverse leaf forms of *Grevillea obtecta*. Large leaf 18 cm long, cental leaf 9 cm, small leaf 6 cm.

Upper Loddon State Forest, 2.xi.1977, *W.M. Molyneux & S.G. Forrester* (CANB, K, MEL 665920, NSW); Glenluce Road, 5.3 km west of the junction with the Malmsbury—Daylesford Road, 28.x.1967, *R.V. Smith 67/166* (AD, CANB, MEL 1527731); Wewak Road, c. 3.9 km by road SW. of Glenluce, 28.x.1967, *R.V. Smith 67/177* (AD, CANB, K, MEL 1527729 and 730, MO, NSW, PERTH); Glenluce Road, c. 5 km SSW. of Glenluce, I.xii.1976, *R.V. Smith 76/48* (AD, CBG, MEL 1527732 and 733; PERTH).

Distribution and Habitat:

Apparently confined to the Fryers Range State Forest and Upper Loddon State Forest in the Taradale—Daylesford area of Central Victoria. A limited occurrence in the Metcalfe State Forest a few kilometres east of Taradale was noted by G. Sitch (Pers. comm., 1983) but I was not able to locate this population.

Occurrence is sporadic over about 400 sq. km in auriferous areas. Plants are found singly or in small populations on slopes and ridges or occasionally on flats where some seasonal moisture collects.

Associated species include *Acacia acinacea, A. aculeatissima, A. mitchellii, A. retinodes, Billardiera procumbens, Burchardia umbellata, Dichopogon strictus, Epacris impressa, Eriostemon verrucosus, E. dives, E. goniocalyx, E. macrorhyncha, E. polyanthemos, E. radiata, Gompholobium huegelii, Goodenia lanata, Grevillea alpina, Hakea sericea, Hardenbergia violacea, Microseris scapigera, Oxylobium procumbens, Persoonia rigida, Platylobium formosum. Poa australis, Prostanthera decussata, Pultenaea pedunculata* and *P. graveolens.*

Biology:

As older flowers wither, new buds commence to develop on other parts of a plant. Many of these wither without completing development, enveloped by the unyielding bracts, whereas some develop in late summer-autumn and are held in a dormant stage until the flowering period of October-December.

I have studied this species in the field (1966-83) and in cultivation and have noted that it sets few seeds when compared to other members of the "aquifolium group". For example, following successive years of good flowering in 1982 and 1983 only twenty-five spent seed capsules and one seedling were located during a search under and around ten plants in

Fig. 4. Distribution of *Grevillea obtecta*.
○ — small-leaved.
● — type collection (small-leaved).
■ — intermediate-leaved.
▲ — large-leaved.

different localities. Three or more suckers were observed growing from the roots of most of these plants. In contrast, *Grevillea repens* sets large quantities of viable seed which germinates and produces numbers of seedlings around parent plants. *G. aquifolium* does likewise in the Grampians (where it does not sucker) although I have never (1963-70) noted seed on the form of this species from the Little Desert (where the form shows considerable sucker regeneration). No specific explanation for these differences in reproduction can be given but it is noted that both *G. obtecta* and the Little Desert form of *G. aquifolium* appear to grow in less favourable environments than either *G. repens* or the Grampians populations of *G. aquifolium* and this could support suckering at the expense of seed production. *G. obtecta* mostly grows on soils which are less friable and which retain less moisture than those which support *G. repens* and the Grampians *G. aquifolium.*

The flowers of *G. obtecta* are highly nectariferous, and their sweet honey-like perfume is quite intrusive. Numerous small ants have been noted attending the flowers.

Discussion:

This new species is a member of the "aquifolium group". This group is well represented within Victoria and includes a number of species which have their known natural distribution confined to relatively limited areas. *G. obtecta* has affinities with both *G. repens* F. Muell. and *G. aquifolium* Lindl. but is readily distinguished from them and from all other species of the group by the much larger, ribbed, floral bracts. Additional comparisons with *G. repens* and *G. aquifolium* are given in Table 1.

G. obtecta is extremely variable in both the size and shape of its leaves (Fig. 3). Generally small-leaved plants occur in the northern area of the species range and intermediate-leaved occur in the southern area. Large-leaved are located between the small and the intermediate but toward the southern end of the known distribution.

The range of leaf length 3-11 cm accounts for 68% of measured specimens, the range 13.5-16 cm for 30% and the length of 18 cm for only 2%. No measurements of 12, 13

or 17 cm were recorded. These figures are based on a total of 300 samples taken from 75 plants.

This is the species referred to by J.H. Willis, 'Handbook Pl. Victoria' 2:40 (1973), as *Grevillea* sp., Elphinstone Grevillea, excluding his reference to " . . . a similar population in Enfield district south of Ballarat". The latter population belongs to a distinct species yet to be described. *Grevillea obtecta* is known in the nursery trade as Fryerstown Grevillea, Taradale Grevillea and Elphinstone Grevillea.

The specific epithet alludes to the large bracts which cover and protect immature flowers and often partly shield mature flowers.

Table 1. Comparisons between *Grevillea obtecta, G. repens* and *G. aquifolium*.

	G. obtecta	G. repens	G. aquifolium
Habit	Prostrate, mostly c. 1 m wide.	Prostrate, mostly c. 1.5 m wide.	c. 2 m high x 2.5 m wide, or prostrate, mostly c. 1.5 m wide,
Leaves	Variable, simple with irregularly serrate margins to pinnatisect; lobes simple or again divided into secondary lobes.	Simple with undulate, dentate margins.	Simple with undulate, dentate margins, or occasionally pinnatifid or ± pinnatisect.
	Mostly glabrous on both surfaces (except when young) or with scattered hairs on undersurface.	Glabrous on both surfaces at all stages or with a few scattered hairs on undersurface.	Mostly glabrous on both surfaces or with a light to dense indumentum on undersurface.
	3-18 cm long x 1.5-8 cm wide.	1.5-11.5 cm long x 0.7-4.0 cm wide.	2-10.5 cm long x 1-4.5 cm wide.
Floral bracts	5-12 mm long x 3-9 mm wide.	0.7-2.1 mm long x 0.4-2.2 mm wide.	0.9-4.1 mm long x 1.4-3.0 mm wide
Rhachis and peduncles	Villous.	Sparingly clothed with silky hairs.	Usually villous.
Pistil	12-16 mm long.	16-19 mm long.	21-26 mm long.
Distribution	Apparently confined to the Upper Loddon and Fryers Range State Forests, north of Daylesford.	Wombat State Forest and Sailor's Falls south of the Daylesford area; also Kinglake National Park and Healesville areas north-east of Melbourne.	Grampians area, Little Desert, and more southern heathlands; also south-east South Australia.

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Mr R.V. Smith (MEL) provided a large suite of his collections for examination. Dr J.H. Willis kindly supplied the Latin diagnosis, and made several constructive comments on the manuscript. Mr D.J. McGillivray (NSW) was always available with advice and his understanding of the "aquifolium group" also greatly assisted me in preparing the manuscript.

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THE STATUS OF THE NAME LASIOPETALUM TEPPERI F. Muell. (STERCULIACEAE)

by

P. S. Short *

ABSTRACT

Short, P. S. The status of the name *Lasiopetalum tepperi* F. Muell. (Sterculiaceae). *Muelleria* 6(1): 153-157 (1985). — Evidence is presented to show that the name *Lasiopetalum tepperi* F. Muell. applies to an interspecific hybrid taxon which is endemic in South Australia. As a nothospecies the taxon is referred to here as *Lasiopetalum* x *tepperi* F. Muell. (pro sp.). A lectotype is chosen for the name *L. tepperi* F. Muell.

INTRODUCTION

Five species of *Lasiopetalum* were recognized as occurring in South Australia by Black (1952). Of these, *L. schulzenii* (F. Muell.) Benth. is quite distinct from the others, having 1-2 bracteoles per flower, yellow petals and reflexed hairs on the style. The remaining species, *L. baueri* Steetz, *L. behrii* F. Muell, *L. discolor* Hook. and *L. tepperi* F. Muell. are closely related, all having 3 bracteoles per flower, red petals and a generally glabrous style. Within the latter group the status of *L. tepperi* is of particular interest.

Lasiopetalum tepperi was described by Mueller (1881) from a collection gathered by J. G. O. Tepper on Yorke Peninsula. Subsequent collections have shown the taxon to be restricted to Yorke Peninsula, Eyre Peninsula and Kangaroo Island, South Australia. In his original description of *L. tepperi* Mueller (1881: 110) stated "Proles forsitan hybrida, tunc orta e L. discolore et L. Baueri, quibus unico loco intercurrit, ut cl. inventor me regante nunc confirmat". That is, he suggested it was a taxon of hybrid origin, possibly derived from *L. discolor* and *L. baueri*, species with which, as ascertained by Tepper, it commonly grows. In a preface to a census of Australian plants Mueller (1882, p.viii) reiterated this belief, stating that "*Lasiopetalum Tepperi* would require to have its appellation changed into *Lasiopetalum Baueri* x *discolor*". However, for the purpose of the census "it was deemed best to admit . . . the very limited number of known bastards under ordinary specific rank".

In 1974 I examined the South Australian species of *Lasiopetalum* as part of a plant taxonomy course at the University of Adelaide and independently concluded that the name *L. tepperi* applies to a hybrid taxon. Furthermore, Jessop (1983), knowing of my work, referred to the taxon as *L.* x *tepperi* F. Muell., but without comment. The reasons for my conclusion are outlined below and a lectotype for the name *L. tepperi* F. Muell. is chosen.

MATERIALS AND METHODS

Pollen fertility and seed set of taxa of *Lasiopetalum* were initially estimated from specimens collected in mallee *Eucalyptus* scrub 5-6 km south-south-west of Port Julia, Yorke Peninsula. These populations are represented in the State Herbarium of South Australia (AD) by the following collections: *L. baueri (P. Short 16), L. behrii (Barker 1784 & P. Short), L. discolor (Barker 851, Barker 1290 & R. Short, Barker 1783 & P. Short), L. tepperi (P. Short 3, P. Short 14).* Subsequently other specimens housed in AD and in the National Herbarium of Victoria (MEL) were examined and measurements of leaf lamina, middle bracteole and calyx were made from selected specimens listed below. The collections selected for measurement came from throughout the geographical ranges of the taxa and were considered representative of the full range of morphological variation observed in each taxon.

Percentage pollen sterility was estimated by using double stain (phloxine and methyl green; Owczarzak 1952) or lactophenol cotton blue.

A scatter diagram (Fig. 1) has been used to illustrate the variation of some of the

*National Herbarium of Victora, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

morphological attributes exhibited by taxa of *Lasiopetalum*. In the diagram averages (from usually six measurements) are plotted for ten or more individual collections of each taxon. The full range of variation observed in each character is expressed in Table I and, for some attributes, is displayed graphically in Fig. 1.

RESULTS

POLLEN STERILITY: Pollen sterility was estimated as being c. 98-100% in *L. tepperi*. In *L. baueri* and *L. behrii* it was c. 4% and in *L. discolor* c. 10%.

SEED SET: No specimens of *L. tepperi*, either examined in the field or on herbarium sheets, have been observed to set seed. All other taxa produce apparently viable seed.

MORPHOLOGY: Features which can be used to recognize the taxa of *Lasiopetalum* considered in this paper are leaf size and shape, the length of the middle bracteole compared to the length of the calyx segments, the number of flowers and their arrangement in an inflorescence and the presence or absence of a stellate indumentum on the inner surface of the calyx segments. In *L. tepperi* a number of these character states are intermediate between or are shared with those found in *L. baueri*, *L. behrii* and *L. discolor* (see Table I and Fig. 1).

Table 1. Morphological characteristics of four *Lasiopetalum* taxa. Extreme measurements are bracketed.

	L. discolor	L. x tepperi	L. baueri	L. behrii
Leaf shape	Ovate or sometimes ± elliptic. Base inconspicuously to conspicuously subcordate.	Ovate to lanceolate. Base inconspicuously to conspicuously subcordate.	± Narrowly elliptic or ± narrowly oblong. Base inconspicuously subcordate.	Lanceolate (rarely ovate), ± narrowly oblong or ± narrowly elliptic. Base inconspicuously subcordate.
Leaf lamina L (length) x W (width) (cm)	2-7(8) x 1-4.5(5.8)	(1.3)3-6(6.2) x 0.4-1(1.2)	2-7(8) x 0.2-0.75(1.25)	2-8(8.7) x 0.45-2(3.1)
Leaf lamina L : W ratio	1.3-2.5(2.9)	(2.6)3-6(6.7)	(4.7)5-12(13.1)	(2.6)3-8(8.4)
Length of middle bracteole (mm)	(5.5)6-8.5(9.2)	(2.8)3.5-7(7.7)	(1.4)1.6-2.8(3)	(1.6)2.2-4(4.5)
Length of calyx (mm)	(3.5)3.8-6.3(6.6)	(3.7)4-7(7.1)	(3.4)3.6-5.4(5.7)	(3.5)4-6.7(7.2)
Bracteole length: calyx length ratio	(1.26)1.5-1.8(2.4)	(0.64)0.94-1.2(1.3)	(0.34)0.4-0.6(0.85)	(0.35)0.4-0.8(0.95)
Colour of calyx	Mauve or pink.	Pink.	White to pink, base green.	White to pink.
Inner surface of calyx	Glabrous.	Moderately to densely hairy.	Moderately to densely hairy.	Glabrous or with some scattered hairs.
Number of flowers per inflorescence	(7)9-14(19) Compact.	(5)6-10(12) ± Crowded to open.	(1)2-4(6) ± Crowded to open.	(2)3-6(8) ± Crowded to open.

DISCUSSION AND CONCLUSIONS

The results clearly show that the name *L. tepperi* applies to an interspecific hybrid taxon, i.e., it is a nothospecies. The name of this nothospecies is *Lasiopetalum* x *tepperi* F. Muell.

L. baueri, *L. behrii* and *L. discolor* are all closely related taxa growing in the vicinity of *L.* x *tepperi* and must therefore all be considered as likely parental species. This contrasts with Mueller's above statement which did not mention *L. behrii* but this species is in fact commonly found on Yorke Peninsula. A note by J. H. Willis on a collection of *L.* x

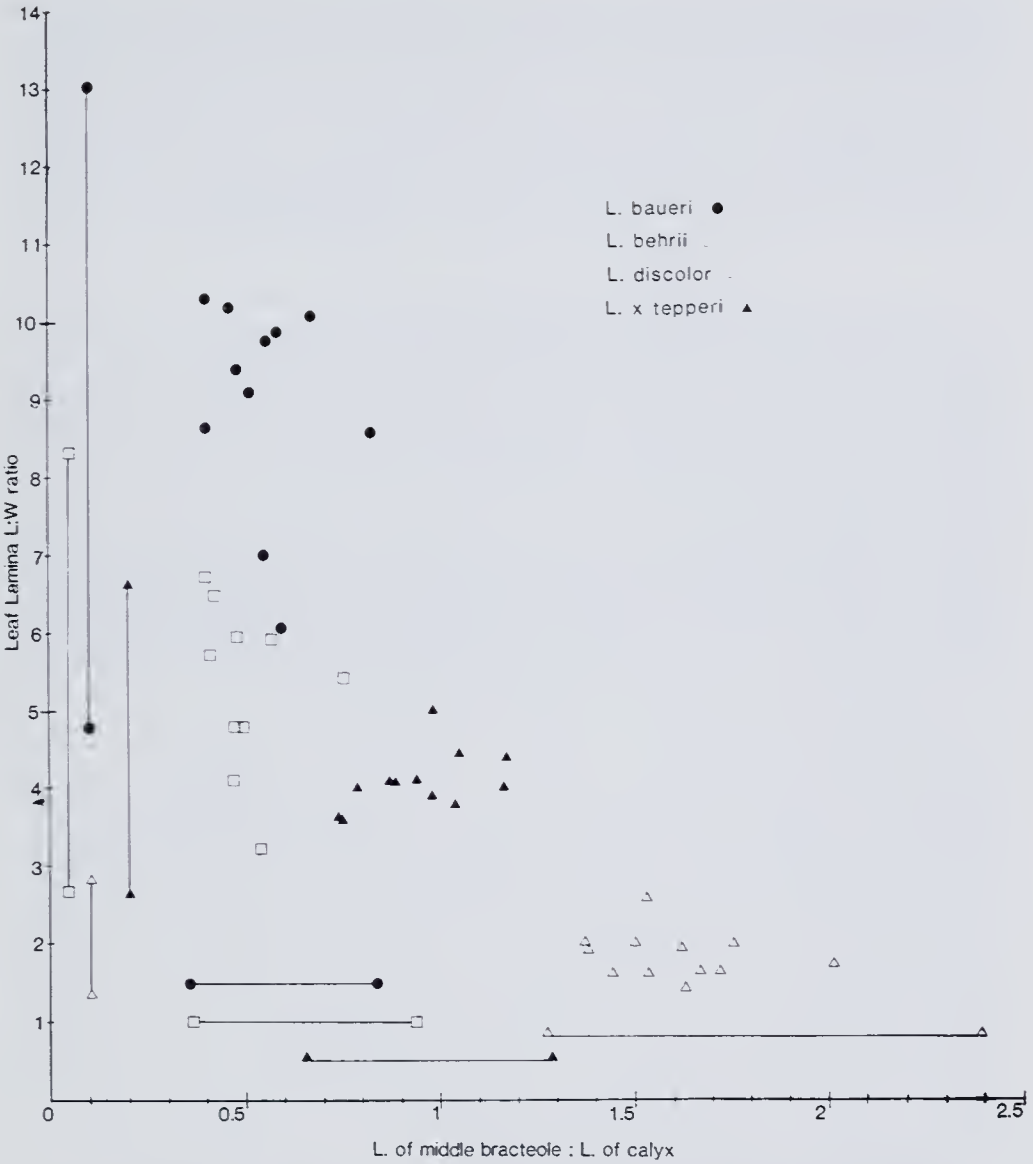

Fig. 1. Scatter diagram portraying some of the morphological variation seen in four taxa of *Lasiopetalum*.

tepperi (*Wigan s.n.*, MEL 643171) from Kangaroo Island also indicates that *L. baueri* and *L. discolor* grow in the vicinity of the hybrid, thus suggesting them as possible parental species. However, *L. behrii* is also known to be quite common on Kangaroo Island. In my main study area near Port Julia all of the above species were common in the vicinity of *L.* x *tepperi,* with all taxa occasionally growing within approximately 10 metres of each other.

The summary of morphological attributes presented in Table 1 and Fig. 1 readily suggests that *L. discolor* must be one of the parental species of *L.* x *tepperi.* This is indirectly supported by the fact that both the hybrid taxon and *L. discolor* are absent from western Victoria although *L. behrii* and *L. baueri* are quite common there.

The other parental species is very much open to question. I suspect, as did Mueller, that *L. baueri* is most likely a parent but this places great importance on the hairy, inner

surface of the calyx segments in that species. This feature is usually absent from *L. behrii* and *L. discolor* but is prominent in *L. tepperi*. On the other hand the calyx segments of *L. behrii* occasionally possess a few scattered hairs on the inner surface and perhaps more importantly the leaf size and shape of *L. tepperi* are generally closer to that of *L. behrii* than *L. baueri*.

Characters such as the flavonoid chemistry and cytology of the respective taxa have not been examined. Such data are highly desirable as it seems impossible to unequivocally determine the parentage of *L.* x *tepperi* on macro-morphological grounds.

LECTOTYPIFICATION OF L. TEPPERI F. MUELL.

In his original publication of *L. tepperi* Mueller (1881: 109) gave the following information: "In vallibus paeninsulae Yorkii; Tepper". Type material of *L. tepperi* exists in both MEL and AD. With the exception of the few individual flowers from J. M. Black's herbarium, all specimens regarded as type or possible type material are of similar appearance, being in each case a small, profusely flowered branch. Only a single sheet exists in MEL. This sheet contains Mueller's manuscript notes and the specimen on it is here chosen as the lectotype.

LECTOTYPE (here designated): *Tepper s.n.*, Yorke Valley, Shrubs 4-5 ft. high, 1880 (MEL 643149). ISOLECTOTYPE: *Tepper s.n.*, Yorke's Peninsula, s. dat. (AD 97506360, ex herb. R. Tate, ex herb. MEL). POSSIBLE ISOELECTOTYPES: *Tepper s.n.*, Yorke Valley Hills, 1880 (AD 97506359, ex herb. R. Tate); *Tepper s.n.*, Yorke Valley Hills, s. dat. (AD 97618131, ex herb. J. M. Black, ex herb. R. Tate, fls only); *Tepper 1154*, Yorke Valley Hills, East of Mr. Wundersitz's Land, 1½ miles. Tall shrubs, bright ruse, 9.ix.1880 (AD 97733526, ex herb. Field Naturalists S.A., ex herb. South Australian Museum).

The data pertaining to the lectotype and cited above were obtained from Tepper's handwritten label accompanying the specimen. A further label, in Mueller's hand, with the sheet gives the locality as "Yorke's Peninsula". This is the same locality given on a MEL label but in an unknown hand on the isolectotype from Professor Ralph Tate's herbarium. There seems no doubt that this collection was viewed by Mueller and subsequently acquired by Tate. Two further collections, regarded as possible isolectotypes, also come from Tate's herbarium (originally housed at the University of Adelaide). One of these, AD 97506359, has no indication that the material was seen by Mueller and there is doubt as to whether the specimen is from the same gathering as the lectotype. The specimen *Tepper 1154*, mounted along with *L. baueri* on a display sheet of "Ardrossan Plants" not only gives a collector's number but also more locality details. However, it appears to have been housed originally in Tepper's own herbarium (see Kraehenbuehl 1969) and it is not unikely that such a specimen would be provided with information additional to that distributed to botanists such as Mueller and Tate. The remaining possible isolectotype originally from Tate's herbarium is a fragmentary specimen acquired by J. M. Black and used by him in the preparation of the 'Flora of South Australia'. The locality information suggests it is from the possible isolectotype sheet, AD 97506359.

SELECTED SPECIMENS EXAMINED

L. x tepperi (All collections excluding types)

South Australia — *Copley 4556* (AD), Copley 4778 (AD), *Eichler 14134* (AD), *Ham s.n.* (AD 96621297), *Jackson 280* (AD), *Jackson 347* (AD), *Jackson 390* (AD), *Jackson 399* (AD), *Phillips s.n.* (AD 96920317, MEL 650456), *Quinn 20* (AD), *P. Short 3* (AD), *P. Short 14* (AD), *Spooner 7358* (AD), *Tepper s.n.* (AD 97733529), *Whibley 5523* (AD), *Wigan s.n.* (MEL 643171).

L. baueri (12/c.240).

South Australia — *P. Short 16* (AD), *Smith 37* (MEL), *Wigan s.n.* (MEL 643270).

Victoria — *Baker s.n.* (MEL 1503397), *Beauglehole 43119* (MEL), *Beauglehole 21415* & *Fink* (MEL), *Mathieson s.n.* (MEL 643269), *Muir 5441* (MEL), *Perry s.n.* (MEL 532341), *Wilson s.n.* (MEL 650491).

Tasmania — *Gee s.n.* (MEL 2650490).

New South Wales — *Phillips 4* (AD).

L. behrii (10/c.399)

South Australia — Barker 1784 & P. Short (AD), *Haegi 702* (AD, MEL), *Jackson 389* (AD), *Phillips s.n.* (MEL 643266, MEL 643275), *Story 8293* (MEL), *Thorne & Eichler s.n.* (MEL 643267), *Turner 5584* (MEL).

Victoria — Aston 1038 (MEL), *Corrick 6328* (MEL).

L. discolor (13/c.174)

Western Australia — Willis s.n. (MEL 643219).

South Australia — Barker 851 (AD), *Barker 1290 & R. Short* (AD), *Barker 1783 & P. Short* (AD), *Carroll s.n.* (MEL 643271), *Maiden s.n.* (MEL 643218), *Morrison s.n.* (MEL 515043), *Newman s.n.* (MEL 1011467), *Orchard 2547* (MEL), *Story 8291* (MEL).

Victoria — ? Tepper s.n. (MEL 643216).

Tasmania — Whinray s.n. (MEL 643272), *Whinray 1478* (MEL).

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